BARA-KOTAH RAILWAY

STANDARD AND METRE GAUGES

REPORT AND ESTIMATES

1896.

BARA-KOTAH RAILWAY.

No. 1856.

FROM

THE ENGINEER-IN-CHIEF,

GOONA-BARA RAILWAY,

Goona, C. I.,

TO

THE SECRETARY TO AGENT TO GOVERNOR-GENERAL,

RAJPUTANA AND CENTRAL INDIA, P. W. D.,

Mount Abu.

Goona, C. I., dated the 1st December, 1896.

SIR,

I HAVE the honour to submit herewith plans and approximate estimates for the Bara-Kotah Railway.

2. The estimates have been framed for both standard and metre gauges and work out respectively to Rs.35,96,422 and Rs.34,87,570; but, if from the metre-gauge the cost of the Rolling-stock be omitted, the latter figure becomes Rs.29,04,488.

3. Were the gauge the standard the main line would be able to make satisfactory arrangements in regard to working the branch, supplying stock as requirements proved necessary; but, with a different gauge to that of the main line, it will be necessary for the branch to have a supply of stock to meet its maximum requirements, much of which stock may, at times, lie idle.

4. The length of the Railway is 42·13 miles, but to the metre-gauge project might be added the length required for a separate yard at Bara. Provision has been made for this work in the estimates; but any work in the yard would naturally be constructed by the main line.

5. The line lies wholly in the Kotah State.

6. The executive work in the field was carried out by Mr. C. Hammond Dracott, appointed a temporary Assistant Engineer for this work, under the direction of Mr. P. T. Sommerville Large, Engineer-in-Chief, Goona-Bina Railway. Early in April Mr. Large left on furlough handing over the project to me for completion and compilation of estimates.

7. Mr. Dracott, who was quite new to the work, deserves great credit for the speed at which he carried through the work in the field.

8. A report on the project, left in draft by Mr. Large, is printed with a few minor corrections. An additional report explaining the estimates prepared by me is attached.

9. I would recommend that as the further extension beyond Kotah is in the far future that, in any case, the standard-gauge be for the present adopted; and, if hereafter the link through Kekri to Nuseerabad be accomplished, the change to metre-gauge will be no difficult matter and the expense on the whole, taking into consideration the difficulty of working this branch on a different gauge, much the same.

I have the honour to be,

SIR,

Your most obedient servant,

H. B. TAYLOR, M.I.C.E.,

Engineer-in-Chief,

Goona-Bara Railway.

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BARA-KOTAH RAILWAY.

REPORT.

References.

(1) Telegram, dated 19th November, 1895, from the Political Agent, Kotah, to the *Engineer-in-Chief, Bina-Goona Railway, stating* "that the Kotah Durbar sanctions Rs.16,500 for its share of proposed survey, Goona to Bara" and also to "arrange to survey portion from Bara to Kotah this cold season with a second survey party."

(2) Telegram, dated 22nd November, 1895, from the Engineer-in-Chief, to Political Agent, Kotah, stating that survey from Goona to Kotah commences on Monday next.

(3) Telegram, dated 15th January, 1896, from the Political Agent, Kotah, according sanction to survey from Bara to Kotah, in anticipation of sanction of Government of India which had been applied for.

(4) Letter No. 78 G., dated 18th January, 1895, from the Political Agent, Kotah, asking for estimate of cost of extension of the survey to Kotah and forwarding copy of letter No. $\frac{2}{c}$ S., dated 15th January, 1896, from the Secretary to Agent, Rajputana and Central India, stating that the Kotah Durbar has asked that the survey of the Railway now in progress from Goona to Bara, may be extended at their cost to Kotah, and that the survey may be put in hand in anticipation of the approval of the Government of India.

(5) Letter No. 538 S., dated 21st February, 1896, from the Secretary to Agent to Governor-General for Rajputana and Central India forwarding copy of telegram from Works Calcutta to Works Rajputana, stating that the Government of India have no objection to Bara-Kotah Survey being carried out at expense of Kotah State on following conditions:—

1st. To take off at Bara from the Main Line of Rutlam-Bara-Muttra Railway.

2nd. The project to be kept entirely separate from the Goona-Bara project, and

3rd. The constructing and working agency to be reserved for future consideration, the estimates to be framed for metre as well as for standard gauge line.

Preliminary.

The proposal for the line is made by the Kotah Durbar who wish to connect their capital of 38,620 inhabitants with imports of 2,60,000 maunds per annum by a broad-gauge Railway traversing the centres of trade of the State with the Railway at Goona. To do this they expressly asked for a direct route passing

about five miles from Bara. A telegram, dated 22nd February, from the Political Agent runs as follows :—

"Kotah Durbar would have preferred line going direct Atro to Antha detour by Bara being more expensive and Antha equally good trade centre but prepared to abide Government decision." So, in accordance with the Government of India decision quoted above, the line starts from and out of the Rutlam-Bara-Muttra Railway proposed station site at Bara.

In accordance with the correspondence detailed in the foregoing references, a second survey party was placed in the field and commenced the survey from Bara to Kotah on the 10th March, 1896.

The country traversed is a practically level one nearly altogether cultivated bearing large crops of wheat, gram, tobacco, sugarcane, oilseeds, &c., and there are a good many villages on the route selected.

The gauge, by the orders of the Government of India, is not finally selected and estimates for both gauges accompany this report. The fixed point is taken from the zero of the Bina-Goona Railway at Bina, and all mileage is reckoned from this point. The total length of the extension from Bara to Kotah is 42·13 miles altogether within the limits of the Kotah State.

Location

The line takes off the centre line of the proposed station of the Rutlam-Bara-Muttra extension of the Bombay, Baroda and Central India Railway 1,000 feet from the north end of the same. It passes close to the village of Pepalda and from thence near Bijora and Khajurna villages direct to the large village and Nizamat of Antha. It then takes north-westerly direction to cross the Kali Sindh River at Kachnaoda where there is a first-rate crossing with shelving rock on the west bank to about half-way across the river, the east bank being composed of boulders over hard clay and probably with rock at no great distance underneath.

The river contracts at this point and as the "Set" of the river is to the west or rocky side, it forms an excellent site for a bridge with inexpensive foundations. From the point of crossing the line takes a south-westerly direction near to the village of Bhonra on the Antha-Kotah road and from thence runs practically parallel with the road close to the villages of Salipura and Dhaslano where there is a good crossing of the Alnia River into Kotah.

The selected stations as approved of by the Kotah Durbar are : *1st*, Tara, 155¾ miles from Bina; *2nd*, Antha (watering station), 163¼ miles from Bina; *3rd*, Kararia, 176½ miles from Bina; and *4th*, Kotah, 2nd class temporary watering station), 191½ miles from Bina.

Alternative Routes.

The only alternative practicable route is that mentioned above under the head Preliminary, *viz*, a direct route from Atro to Antha which the Durbars selected for the reasons given above. The difference between the two routes is about 4½ miles, the selected being the longest or say, at an extra cost to the Kotah State, of three lacs of rupees.

Gradients and Curves

The ruling gradient is 1 in 200 and is distributed equally all over the extension. The sharpest curve is two degree chord angle or 2,865 feet radius. No compensation on curves is provided. See form R. 1 and R. 2 giving details and distribution of gradients and curves.

Construction and Engineering.

The country is essentially one for building in stone. Good quarries are in existence within easy distance of Bara whilst first-rate laminated sandstone is

procurable at the Kali Sindh River, at the bridge site. Lime however is scarce. The soil is mostly black cotton with rock underlying and no difficulty is anticipated with regard to an efficient ballast supply.

The number of lineal feet of waterway per mile is 65·53.

The most important work on the line will be the bridge over the Kali Sindh at Kachnaoda, 18 spans of 100 feet, Government type, with a footway outside on masonry piers is proposed. The underside of girders will be 105 feet above bed of river and 11·2 feet above highest known flood. Very fine sandstone, as already stated, is found in any quantity at the selected site. No difficulty is anticipated with the remaining bridges which are all of the flat-top or arched type, the principal being over the Alnia River near Kotah over which an ancient arched road bridge is in existence and carries the road traffic.

It is proposed to fence the line throughout with a five strand wire fence of seven strands per wire No. 4 gauge of a similar pattern to that erected on the Bina-Goona Railway.

The Permanent-way proposed is the Government of India 75lbs., 4-inch foot, steel rail with four holes fish-plates laid on 135lbs. steel sleepers* with corrugated clips, distance pieces and steel keys, and a similar pattern for the metre-gauge, if such should be adopted. All passenger platforms are proposed to be one foot above rail level for the standard-gauge and for the metre-gauge well consolidated platforms to rail level only. Goods platforms for both gauges will be at the standard heights laid down by the Government of India for such.

There will be neither branch nor general workshops in the case of the standard-gauge being adopted, but in case of the metre-gauge such machine, tools as are necessary for repairs will have to be provided at Bara or Kotah. Water is plentiful throughout and for engine-watering stations Antha and Kotah have been selected besides the junction at Bara. Water will be raised at the former two places by the ordinary water-lift worked by bullocks and at Bara, by a steam-pump into high service tanks which will probably be an engine-changing station. No rolling-stock is estimated for the broad-gauge, but in case the metre-gauge is adopted provision has been made in the estimates for the same.

Labour and materials.

It is anticipated that no difficulty will be found in procuring petty contractors and skilled or unskilled labour. The former always follows Railway extensions and the population of the Kotah State renders the latter assured for the local earthwork. All buildings will be in stone. The country is a sandstone country and good stone of this description is easily procurable.

Lime is scarce but no difficulty is anticipated in procuring a sufficient supply. Ballast, it is expected, will be easily procurable as rock underlies the soil in most places in the Kotah State. Bridge material and Permanent-way will be delivered by rail at Bara and led to site as the plate-laying advances. Rates and wages are of the ordinary description both for skilled and unskilled labour.

Arrangement of Staff.

If it is assumed that the line will be constructed by State Agency at the same time as the line from Goona to Bara, one Engineer-in-Chief can with his direction staff, build both lines and would require only one District and two Assistant Engineers with the usual subordinates, medical and office establishment to assist him.

The District Engineer would be stationed at Antha near the principal work, the Kali Sindh Bridge. One Assistant at Bara and the other at or near Dhaslano on the Kotah side. Two Hospital Assistants under the orders of the State Surgeon would be all that would be necessary for care of medical and sanitation with suitable dispensaries at Bara and Antha.

Relations with the Public and Government Department.

None of the proposed Railway works will interfere with any military Cantonment. The only bridge, of any considerable size on the line, the Kali Sindh, will have an iron decking suitable for crossing heavy guns on their wheels and also an outside footway.

The ordinary type of 3rd class stations will be provided at every station except Bara where a station of 2nd class type with waiting and refreshment-rooms and waiting-sheds for 3rd class passengers will be necessary. It is proposed to put up a temporary station only at Kotah with engine-shed and turntable so that should the line be extended to the west of the Chambal River, in the future, the station site can be changed with reference to the proposed crossing. I examined this river for the latter. There are three practicable sites—one between the city and the Residency, one above the city and one near the village Dhadwaro below the Residency.

The station site proposed is with reference to the former one. It is on a fine open plain and is convenient to the civil station as well as to the city; and this site examined was south of the city, but there would be a sharp gradient up to this site and down again to the river crossing. This site is wholly on sheet rock. Fine red sandstone is abundant at Kotah in the Chambal River.

Land.

The land will be provided by the Kotah Durbar.

Traffic and Statistics.

It will be seen from the Appendices which give trade statistics for Kotah, Antha and Bara that the imports amount to 2,71,497 maunds and exports 2,18,457 maunds or total 4,89,954 maunds.

I have also no doubt that on the opening of the Railway the exports and imports will largely increase owing to the facilities afforded for the same and the enrichment of the inhabitants by a large trade.

P. T. S. LARGE, M.I.C.E.,
Engineer-in-Chief, Goona-Kotah Railway.

To the above report, left in draft by the late Engineer-in-Chief, I have to add the following :—

Choice of Gauge.

The question of gauge hinges on the possibility of future extension beyond Kotah to form a connection with the Rajputana-Malwa Railway.

The most probable direction is *viâ* Boondee, Deoli and Kekri to Nuseerabad, and a branch line on the metre-gauge is, I understand, contemplated by the Rajputana-Malwa Railway to Kekri. But the completion of this link being so far in the future and taking into account the difficulty in working a branch on a different gauge, I think the standard-gauge has the advantage; and if, hereafter, through connection be made, the change from standard to metre-gauge will be easily accomplished.

A break of gauge virtually adds 10 miles to the distance taking 6 pies per ton mile as the rate and a terminal charge of something under 3 pies per maund at the break. I understand, moreover, that merchants are averse from

submitting goods to the extra handling entailed by break of gauge and will avoid such, as much as possible. This would, no doubt, mean that all the produce of Antha and thereabouts, would go in carts to Bara for rail and so the lead over the Antha-Bara Section would be lost.

In the Administration Report by the Director-General of Railways, it is stated that the average working expenses, per train mile, were in 1894-95 Re.1·98 on the standard-gauge against Re.1·51 on the metre-gauge; but then the average earnings show much the same ratio. But even should the metre-gauge, for the present, be more advantageous financially, it would appear unwise to introduce a separate gauge into a new system of Railway and more especially when by so doing the Capital of the State, owning and constructing the lines, is cut off from through running with the Railway systems of India.

The cost of the Rolling-stock necessary for working the branch on the metre-gauge works out to Rs.5,83,082.

Location.

The line, as located, commences at the north end of the yard at Bara as alligned by the Nagda-Muttra survey party. An improvement in both lines can be made by shifting the station site in a south-westerly direction. The crossing over the Kali Sindh River is obligatory, but otherwise the country is much the same and a considerable shortening in the length of line is possible.

Curves.

It is proposed, when sanction to the project be accorded, to increase the radii of the curves where possible.

Construction and Engineernig

The Kali Sindh Bridge I have taken as 12 spans of 150 feet, which amply passes the flood discharge at a reasonable velocity. I select 150 feet as the largest size girder span that can be conveniently hoisted into position after erection of the main girders below. A deep pool at the crossing will necessitate special arrangements for the foundations of two piers. The stone for the bridge can be obtained in the river-bed, some two miles up-stream. For estimating purposes, I have adopted pier abutments, but the west abutment being in good rock it will possibly be advantageous to build wings, as the toe of the slope would be subject to a great rush of water.

I have been unable to obtain a drawing of a 150 feet girder span as all spare copies with the Government of India were burnt in the fire at the Simla Secretariat last year. In designing the bridge I have taken $4\frac{1}{2}$ feet from girder bed to rail level and have taken 10 feet as the thickness of piers at top.

The Alnia Bridge, 6 spans 60 feet, is more waterway than the drainage area of the river requires, but the crossing selected necessitates this liberality. Up-stream, an old road bridge with lineal waterway of 320 feet made up of 16 feet archways, has passed the floods successfully for many years, it having been built in 1818 A.D. as the following inscription on it shows :—

" This bridge was constructed in 1818 A.D. by Lieutenant-Colonel James Todd, Political Agent, from the proceeds of plunder taken from the Pindaries by a small force of Bengal Sepoys assisted by the Kotah troops and was erected in memory of His Excellency the Marquis of Hastings, Governor-General of India. "

The extraordinary high floods, no doubt, passed over the embankment at the ends, which are kept lower than the centre of the bridge.

Stone for this bridge can be obtained from a quarry, a mile up-stream from the crossing.

Fencing. Fencing has been estimated for throughout, but the expenditure under this head might be largely postponed until continuous fencing be found necessary; in the meantime station-yards and crossings close to large villages alone being fenced.

For estimating purposes the State Railway type, has been taken, but it is proposed to erect the same fencing as used on the Bina-Goona Railway.

Permanent-way The steel trough sleepers as used on the late extensions in Central India are now understood to be less advantageous than wooden sleepers or cast-iron pots. Sal sleepers have therefore been estimated for, the cost working out to much about the same as the steel trough; but if Deodar can be obtained a considerable saving will result.

Station arrangements At 3rd class stations the passenger-platform is placed on the Loop and a short dead-end is provided for goods. At Kotah the yard is so designed as to allow freely of expansion; the goods and passenger platforms are both on the city side as in every way most convenient. Though the estimates provide for a 2nd class station, it is not proposed to erect a permanent structure until the allignment for the possible further extension across the Chambal be decided upon. Goods-sheds at Antha and Kotah will only be put up when found necessary.

Station Buildings. It is proposed to erect station buildings somewhat similar in design to those on the Ujjain-Bhopal Railway which lend themselves readily to future extension, should such at any time be found necessary.

Station Sites. The Durbar has approved of the sites for stations.

English Materials. The rates for English materials have been taken from the Director-General of Railways' Circular No. 11 of 1896 and Expenditure calculated in rupees at an Exchange of *1s.2d.*, which rate at present is well on the safe side. The rate now existing gives something like a saving of 10 per cent. on the estimated English expenditure, close on one lac of rupees for the standard and a lac and a quarter for the metre-gauge project; but *1s. 2d.* is taken as approximating to the rate adopted for the year by the Government of India.

Contingencies. In the estimates contigencies have not been allowed for except in the case of bridge work for which estimates are worked out in detail. The earthwork quantities were also taken out in detail, chain by chain.

Royalties and Local Taxation. No allowance has been made in the estimates for royalties or seigniorage or for local taxation of any kind.

Audit & Accounts. Provision has been made for the estimated cost of the monthly post audit of expenditure usual on State Railways. It is proposed to place this audit in the hands of the Government Examiner of Accounts, Indian Midland Railway at Jhansi, who would audit all cash and stores outlay including establishment charges; compile the monthly accounts of receipts and expenditure for submission to the Durbars; give the Engineer-in-Chief the usual acquittance for his divisional expenditure monthly; and generally act as financial adviser to the Engineer-in-Chief and Audit Officer for the system. This arrangement, it is

considered, will be more satisfactory than that which obtained for the Bina-Goona Railway, where the partial audit by a Government Officer was carried out so long after the events reviewed as to seriously interfere with its value from the administrative as well as audit points of view.

This procedure has already been adopted for the Goona-Bara Railway.

The estimates for the standard and metre gauges work out respectively to Rs.35.96,422 and Rs.34,87,570. The latter figure includes the cost of rolling-stock as well as the cost for a separate yard at Bara with an engine-shed, turntable, &c. **The Estimates.**

The stock estimated for in the metre-gauge project is sufficient to allow of two mixed trains being made up as also a couple of goods trains and with sufficient more stock for special traffic and for ballasting purposes. **Rolling-stock.**

The estimates for standard and metre gauge work out to respectively Rs 85,365 and Rs.82,781 per mile. This rate is largely influenced by the high cost of the Kali Sindh Bridge, which accounts for above one-fourth of the total cost of the Railway. **Rate per Mile**

One set only of plans and drawings is submitted, that for the standard-gauge For the metre-gauge, but few drawings require alteration as it is proposed that even should this gauge be adopted, that the major bridges, in regard to masonry work, be built to take standard-gauge girders. **Plans & Drawings.**

H. B. TAYLOR, M.I.C.E.,
Engineer-in Chief,
Goona-Bara Railway.

GOONA, C. I. :
The 23rd November, 1896

BARA-KOTAH RAILWAY.

Standard and Metre Gauges.

TABULATED DETAILS AND APPENDICES

TO

REPORT.

BARA-KOTAH RAILWAY.

(*Standard and Metre Gauges.*)

Length of Line (42·13 *Miles*).

List of Stations Bara to Kotah sanctioned by the Kotah Durbar.

Number.	Name.	Class.	Watering.	Distance apart.	Through Mileage from Bina.	Remarks.
0	Bara	2nd	W			
				$6\frac{3}{4}$		
1	Tara	3rd	...		$155\frac{3}{4}$	
				$7\frac{1}{2}$		
2	Antha	3rd	W		$163\frac{1}{4}$	
				$13\frac{1}{4}$		
3	Kararia	3rd	...		$176\frac{1}{2}$	
				15		
4	Kotah	2nd	W		$191\frac{1}{2}$	

Form R. I.

Bara-Kotah Railway.

(*Standard and Metre Gauges.*)

(42·13 *Miles.*)

CURVE ABSTRACT.

Angle of Curvature or Radius.	Number of each.	Total Length. — Miles.	Total Curvature. — Degrees.
2°0′ (R=2,865 feet)	1	0·433	45·666°
1°0′ (R=5,730 „)	5	3·118	164·616°
0°30′ (R=11,460 „)	1	1·471	38·833°
Total ...	7	5·02	249·12°

Ratio of curve to total length of line = 11·91 per cent.

Average amount curvature per mile = 5·91 degrees.

Form R. II.

Bara-Kotah Railway.

(*Standard and Metre Gauges.*)

(42·13 *Miles.*)

GRADIENT ABSTRACT.

Inclination.	Number of each.	Total Length. — Miles.	Percentage of Total Length of Line.
1 in 200 or 0·50 per cent.	5	4·62	10·96
1 „ 201 to 1 in 300 or 0·33 per cent. ...	9	6·82	16·19
1 „ 301 to 1 in 500 or 0·20 „ ...	10	6·73	15·97
1 „ 501 to 1 in 1,000 or 0 10 „ ...	12	8·39	19·92
Flatter than 1 in 1,000 including level ...	20	15·57	36·96
Total ...	...	42·13	100·00

Form R. III.

Bara-Kotah Railway.

(*Standard and Metre Gauges.*)

(42·13 *Miles.*)

BRIDGE ABSTRACT.

Type of Bridge: Class.	Spans.	Total number of spans.	Waterway. Lineal feet.
Flat tops	3 feet	47	141
Arched Culverts	6 „	2	12
	12 „	14	168
	20 „	14	280
Girder Bridges	60 „ one of six spans ...	6	360
	150 „ one of twelve spans ...	12	1,800
	Total for Whole Line, ...	...	2,761
	Average per mile	...	65·53

Form R. IV.

Bara-Kotah Railway.

(Standard and Metre Gauges.)
Length (42·13 Miles).

IMPORTANT BRIDGES.

Number.	Name of River.	Mileage.	Drainage Area.	Rise of ordinary flood above low water.	Slope of bed per mile.	Mean velocity in flood per second.	Sectional area in flood.	Discharge per second.	Span.		Height of under side of girders.		Average depth of Founds.
									Number.	Span.	Above low water.	Above flood level.	
			Sq. ms.	Ft.	Ft.	Ft.	Sq. ft.	Cub. ft.	No.	Ft.	Ft.	Ft.	Ft.
						Bazin's Formula.		Dickens' K = 825					
19	Kali Sindh	167·20	8,554	56·5	0·73	6·9	77,035	733,805	12	150	88 91	11·20	12
						From discharge and flood area.							
						9·5							

The country drained is largely waste and forest lands. The mean rainfall varies from about 49 inches at source to about 37 inches at crossing.

Masonry.—Open founds in rock 12 feet below low water-level. For two piers special arrangements are necessary. Rails between girders, Single Line.

						Bazin's Formula.		Dickens' K = 825					
48	Alnia...	187·19	254	23·54	4·74	8·58	13,546	52,568	6	60	28 60	5·06	8
						From discharge and flood area.							
			...			6·10							

A part of the area drained is hilly country, but most of the area is cultivation. The mean rainfall is about 37 inches.

Masonry.—Open founds in rock about 8 feet below low water-level. Rails above girders, Single Line.

For both these rivers the mean velocity is calculated from declivity of bed; and also obtained by dividing the discharge, obtained from Dickens' Formula with K=825 by the flood area.

Form R. V.

Bara-Kotah Railway.

(Standard and Metre Gauges.)

(42 13 Miles.)

STATION BUILDINGS.

Name of Stations.	Class.	Mileage.	Distance apart.	Station Buildings.	Goods Shed.	Passenger Platform.		Goods Platform.	Station Masters' Quarters.		Assistant Station Masters' or Signallers' Quarters.		Menials' and Police Quarters.		Well.
						Length.	Height over Rails.								Diameter.
			Miles.	Sq. ft.	Sq. ft.	Ft.	Ft.	Ft.	Unit No.	Sq. ft.	Unit No.	Sq. ft.	Unit No.	Sq. ft.	Ft.
Tara ..	3rd	155¾	6¾	1,500	..	600	1	..	2	1,680	Combined.		6	1,240	6
Antha ..	3rd	163¼	7½	1,500	2,600	600	1	200	3	2,200	,,		8	1,660	6
Kararia ..	3rd	176½	13¼	1,500	..	600	1	..	2	1,680	,,		6	1,240	6
Kotah ..	2nd	192½	15	3,800	2,600	600	2½	400	3	2,200	,,		8	1,660	6
													6	1,240	Loco. menials.
													1	1,917	Running Room.

Form R. VI.

Bara-Kotah Railway.

(5' 6" Gauge.)

(42·13 Miles.)

STATION MACHINERY.

Name of Stations.	Station Ashpits.	Water-columns.		Piping.		Water Tank.	Well.			Switches.			Crossings.				Main Signals.	Distant Signals.	Weigh Bridge.		Engine Shed.	Loco. Ashpits.	Engine Turntable.
		Number.	Diameter.	Length.	Diameter.	Capacity.	Diameter.	Steam Pump.	Water Lift.	15 feet.	12 feet.	Total.	1 in 12.	1 in 8½.	1 in 6.	Total.			Number.	Capacity.	Area.		
Bara	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...
Tara	...	...	...	...	...	...	...	...	...	2	1	3	2	1	...	3	1	2	...	...	...	...	...
Antha	2	2	8"	1,000'	8"	9,600	12'	...	1	2	1	3	2	1	...	3	1	2	...	...	...	...	...
Kataria	...	...	...	...	...	...	...	...	...	2	1	3	2	1	...	3	1	2	...	...	...	...	...
Kotah	2	2	8"	1,000'	8"	9,600	12'	...	1	4	5	9	4	5	...	9	1	1	...	...	2,735'	...	1

Form R. VI.

Bara-Kotah Railway.

(Metre-Gauge.)

(42·13 Miles.)

STATION MACHINERY.

Name of Stations	Station Ashpits.	Water columns.		Piping.		Water Tank	Well.			Switches.			Crossings.				Main Signals.	Distant Signals.	Weigh Bridge.		Engine Shed.	Loco. Ashpits.	Engine Turntable.
		Number.	Diameter.	Length.	Diameter.	Capacity.	Diameter.	Steam Pump.	Water Lift.	15 feet.	12 feet.	Total.	1 in 12.	1 in 8½.	1 in 6.	Total.			Number.	Capacity.	Area.		
Bara	2	1	8	100'	8"	...	...		...	4	5	9	4	5	...	9	...	1	1	25	2,735	2	1
Tara	...	...	...	...	...	...	...	...	...	2	1	3	2	1	...	3	1	2	...	...	...	...	...
Antha	2	2	8"	1,000'	8"	9,600	12'	...	1	2	1	3	2	1	...	3	1	2	...	...	...	...	...
Kararia	...	...	...	...	...	...	...	...	...	2	1	3	2	1	...	3	1	2	...	...	...	...	...
Kotah	2	2	8"	1,000'	8"	9,600	12'	...	1	4	5	9	4	5	...	9	1	1	...	...	2,735	...	1

Bara-Kotàh Railway.

(5' 6" *Gauge*)

Kotah State (42·13 *Miles.*)

List of Articles required from England.

Description of Articles.	Quantity.	English Cost.			Rate of Exchange.	English Cost.	Indian Charges.	Total...
		F. O. B.	4-5th Freight.	Total.				
		£	£	£	1s. 2d. = 17·1429 rupees per £ Sterling.	Rs.	Rs.	Rs.
Girders for Major Bridges	1892·38 tons.	17,201	1,852	19,053		3,26,623	21,746	3,48,369
Fencing	86 miles.	5,281	715	5,996		1,02,788	7,970	1,10,758
Permanent-way ...	45·13	25,983	3,155	29,138		4,99,509	28,992	5,28,501
Station Machinery ...	...	1,217	73	1,290		22,114	1,226	23,340
Total ...	...	49,682	5,795	55,477		9,51,034	59,934	10,10,968

Metre-Gauge.

		£	£	£	1s. 2d. = 17·1429 rupees per £ Sterling.	Rs.	Rs.	Rs.
Girders for Major Bridges	1641·7 tons.	15,524	1,592	17,116		2,93,417	17,541	3,10,958
Fencing	86 miles.	5,281	715	5,996		1,02,788	7,970	1,10,758
Permanent-way ...	47·63	18,304	1,918	20,222		3,46,663	26,856	3,73,519
Station Machinery ...	...	1,502	63	1,565		26,829	1,295	28,124
Rolling-stock ...	...	26,125	1,158	27,283		4,67,710	18,447	4,86,157
Total ...	...	66,736	5,446	72,182		12,37,407	72,109	13,09,516

Bara-Kotah Railway.

Return of Annual Rainfall of the Kotah State.

Years.	Atro.		Bara.		Antha.		Kotah City.		Remarks.
	Inches.	Cents.	Inches.	Cents.	Inches.	Cents.	Inches.	Cents.	
1886-87	29	16	52	65	29	22	38	14	
1887-88	41	72	26	56	42	81	27	51	
1888-89	31	36	47	48	27	60	39	6	
1889-90	46	85	36	9	55	49	18	15	
1890-91	47	28	24	1	28	41	20	56	
1891-92	26	53	25	56	17	84	21	20	
1892-93	51	50	60	22	55	77	41	92	
1893-94	38	21	32	16	34	91	31	12	
1894-95	43	24	39	64	39	67	31	33	
1895-96	25	76	24	28	25	63	24	28	

Bara-Kotah Railway.

Statement of Imports and Exports of Bara.

No.	Name of articles.	Sambat 1951 (1894-95.)		Remarks.
		Imported.	Exported.	
		Rs. a. p.	Mds. srs. ch.	
1	Cloth	40,112 2 0	..	
2	Species	4,999 14 6	1,453 0 0	
3	Metals	1,884 8 0	..	
4	Fruits, foreign	25 4 0	..	
5	Groceries	7,398 13 9	..	
6	English thread	9,012 6 0	..	
7	False Silver thread	381 10 0	..	
		Mds. srs. ch.		
8	Sugar	126 36 0	..	
		Rs. a. p.		
9	Saline mud	134 0 0	..	
10	Silver thread	257 0 0	..	
		Mds. srs. ch.		
11	Country tobaccos	144 12 8	4 0 0	
12	Grain	237 16 0	98,618 16 4	
13	Oil-seeds	27 12 0	4,811 3 5	
14	Iron	93 10 0	..	
15	Steel	151 17 0	..	
16	Goor	143 19 0	..	
17	Rice	530 9 0	..	
18	Hides	..	No. 4,692	
			Mds. srs. ch.	
19	Opium	..	102. 27 9	
20	Ghee	..	249 29 10	
21	Indigo, raw	..	44. 15 0	
22	Mungphali (pignuts)	..	215. 32 8	
23	Oil	..	22 10 0	
24	Cotton	..	23 10 0	

Bara-Kotah Railway.

Statement of Imports and Exports of Antha.

No.	Name of articles.	Sambat 1951 (1894-95).		Remarks.
		Imported.	Exported.	
		Mds. srs. ch.	Mds. srs. ch.	
1	Species	282 0 0	8 0 0	
2	Fruits, foreign and local	1 0 0	..	
3	Sugar	40 0 0	2 0 0	
4	Zarda tobacco	..	..	
5	Country tobacco	13 0 0	..	
6	Grain	4,470 0 0	91,350 0 0	
7	Oil-seeds	92 0 0	13,650 0 0	
8	Goor	28 0 0	6 0 0	
9	Rice	524 0 0	..	
10	Opium	194 0 0	1 0 0	
11	Ghee	120 0 0	..	
12	Cotton and Cotton-seeds	108 0 0	101 0 0	
13	Indigo, raw	..	93 0 0	
14	Pignuts	..	17 0 0	

Statement of Imports and Exports of Kotah City.

No.	Name of articles.	Sambat 1951 (1894 95).		Remarks.
		Imported.	Exported.	
		Mds. srs. ch.	Mds. srs. ch.	
1	Cloth	8,447 0 0	..	
2	Species	16,770 0 0	700 0 0	
3	Metals	936 0 0	..	
4	Fruits, foreign and local	277 0 0	125 0 0	
5	English thread	854 0 0	..	
6	Sugar	9,873 0 0	70 0 0	
7	Country tobacco	..	..	
8	Grain	1,88.568 0 0	746 0 0	
9	Oil-seeds	5,854 0 0	389 0 0	
10	Iron	414 0 0	..	
11	Steel	1,447 0 0	..	
12	Malwa tobacco	3,293 0 0	..	
13	Goor	9,851 0 0	1 0 0	
14	Rice	4,225 0 0	35 0 0	
15	Opium	1,955 0 0	2,595 0 0	
16	Oil	729 0 0	21 0 0	
17	Ghee	5,617 0 0	2 0 0	
18	Cotton and Cotton-seeds	564 0 0	..	
19	Other miscellaneous articles	951 0 0	..	

BARA-KOTAH RAILWAY.

Standard and Metre Gauges.

GENERAL ABSTRACT OF ESTIMATES.

Bara-Kotah Railway.

Standard and Metre Gauges.

Kotah State (42·13 Miles.)

GENERAL ABSTRACT.

HEADS OF ACCOUNT.	TOTAL COST IN RUPEES FOR 5' 6" GAUGE.				TOTAL COST IN RUPEES FOR METRE-GAUGE.			
	Minor Heads.		Main Heads		Minor Heads.		Main Heads.	
	Total cost	Rate per mile.	Total cost.	Rate per mile.	Total cost.	Rate per mile.	Total cost.	Rate per mile.
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
I.—Preliminary expenses—			14,745	350			14,745	350
1. Survey Expenses	1,685	40			1,685	40		
2. Plant	1 053	25			1,053	25		
3. Establishment	12,007	285			12,007	285		
II.—Land—			2,107	50			2.107	50
III.—Formation—			2,52,249	5,988			2,18,837	5,194
1. Earthwork	2,52,249	5.988			2,18,837	5,194		
2. Tunnels								
IV.—Bridgework—			12,61,450	29,942			11,83,607	28,095
1. Large Bridges	10,64,216	25,260			9 99,368	23.721		
2 Minor Bridges	1,97,234	4,682			1,84,239	4,373		
V.—Fencing—			1,48,692	3,529			1,48.692	3,529
1. Fencing	1,37,895	3,273			1,37,895	3,273		
2. Road Crossings	9,100	216			9,100	216		
3 Mile and Gradient posts ...	1,697	40			1,697	40		
VI.—Electric Telegraph—			2,500	59			2,500	59
VII.—Ballast and Permanent-way—			14,94,793	35,481			8,94,058	21,222
1. Ballast	1,87,901	4,460			1.16,669	2,770		
2. Permanent-way	13,06,895	31,021			7,77,389	18,452		
VIII. Stations and Buildings—			1,77,625	4.216			1,97,560	4,689
1. Stations and Offices ...	70,800	1,680			70,800	1,680		
2. Workshops & Store Buildings								
3. Staff Quarters	41,000	973			41,000	973		
4. Station Machinery ...	65,825	1,563			85,760	2,036		
IX.—Plant—			8,257	196			8,381	199
1 Engineering	2,257	54			2,381	57		
4. Station and Office Furniture ...	6,000	142			6,000	142		
X.—Steam Ferries—			...	...			...	...
XI.—Rolling Stock—			...	...			5,83,082	13,840
1 Locomotives	...	...			2,21,232	5,251		
2. Carriage and Wagons ..	...	...			3,61,850	8,589		
XII.—General Charges—			2,34,001	5,554			2,34,001	5,554
1 Direction	36,892	876			36,892	876		
2. Engineering	1,62,496	3 857			1,62 496	3,857		
3. Stores	8,692	206			8 692	206		
4 *Audit and Accounts* ...	11,541	274			11,541	274		
5. Medical and Sanitation ...	14,380	341			14,380	341		
Total, Rs. ...	...	...	35,96,422	85,365	...	...	34,87,570	82,781

H. B. TAYLOR, M.I C.E.,

Engineer-in-Chief,

Goona-Bara Railway.

BARA-KOTAH RAILWAY.

(5′ 6″ Gauge.)

ESTIMATES.

Bara-Kotah Railway.

(5' 6" *Gauge.*)

Kotah State (42·13 *Miles*).

ABSTRACT.

HEADS OF ACCOUNT.	TOTAL COST IN RUPEES.			
	MINOR HEADS.		MAIN HEADS.	
	Total cost.	Rate per mile.	Total cost.	Rate per mile.
	Rs.	Rs.	Rs.	Rs.
I.—Preliminary Expenses—			14,745	350
1. Survey Expenses	1,685	40		
2. Plant	1,053	25		
3. Establishment	12,007	285		
II.—Land—			2,107	50
III.—Formation—			2,52,249	5,988
1. Earthwork	2,52,249	5,988		
2. Tunnels				
IV.—Bridgework—			12,61,450	29,942
1. Large Bridges	10,64,216	25,260		
2. Minor Bridges	1,97,234	4,682		
V.—Fencing—			1,48,692	3,529
1. Fencing	1,37,895	3,273		
2. Road Crossing	9,100	216		
3. Mile and Gradient posts ..	1,697	40		
VI.—Electric Telegraph—			2,500	59
VII.—Ballast and Permanent-way—			14,94,796	35,481
1. Ballast	1,87,901	4,460		
2. Permanent-way	13,06,895	31,021		
VIII.—Stations and Buildings—			1,77,625	4,216
1. Stations and Offices	70,800	1,680		
2. Workshops and Store Buildings..				
3. Staff Quarters	41,000	973		
4. Station Machinery	65,825	1,563		
IX.—Plant—			8,257	196
1. Engineering	2,257	54		
2. Station and Office Furniture ..	6,000	142		
X.—Steam Ferries—				
XI.—Rolling-stock—				
1. Locomotive				
2. Carriage and Wagon.. ..				
XII.—General Charges—			2,34,001	5,554
1. Direction	36,892	876		
2. Engineering	1,62,496	3,857		
3. Stores	8,692	206		
4. Audit and Accounts.. ..	11,541	274		
5. Medical and Sanitation ..	14,380	341		

Total Cost, Rs.35,96,422.

Length in Miles, 42·13.

Total Rate per Mile, Rs.85,365.

H. B. TAYLOR, M.I.C.E.,
Engineer-in-Chief,
Goona-Bara Railway.

Bara-Kotah Railway.

(5' 6" *Gauge.*)

Kotah State (42·13 *Miles*).

I.—PRELIMINARY EXPENSES.

Sub-Heads.	Quantity.	Unit.	Rate.	Amount	Total.
			Rs.	Rs.	Rs.
1. Survey Expenses	42·13	mile.	40	1,685	
2. Plant	42·13	,,	25	1,053	
3. Establishment	42 13	,,	285	12,007	
Total Preliminary Expenses ...	...	...	...	...	14,745

Rate per Mile, Rs.350.

For detailed Estimate see Appendix A. This Estimate has already received sanction by the Government of India—*vide* letter No. 328 R. C., dated Calcutta, 10th March, 1896, from the Government of India, P. W. D., Railway Construction, to the Agent, Governor-General in Central India.

II.—LAND.

Description of work.	Quantity.	Unit.	Rate.	Amount.	Total.
			Rs.	Rs.	Rs.
Compensation for damage to private property	42·13	mile.	50	2,107	
Total Land, Rs. ...	...	...	...	...	2,107

Rate per Mile, Rs.50.

Land will be provided free.

Bara-Kotah Railway.

(5' 6" *Gauge.*)

Kotah State (42·13 *Miles*).

III.—FORMATION.

1.—Earthwork.

Sub-heads.	Quantity.	Unit.	Rate.	Amount.	Total.	Grand Total.
			Rs.	Rs.	Rs.	Rs.
Earthwork in Bank ...	1,49,97,842	1,000 c.ft.	4	59,992		
Do. do. ...	1,12,40,188	,,	6	67,442		
Do. do. ...	47,58,410	,,	10	47,585		
Do. in Cuttings ...	17,35,416	,,	5	8,677		
Hard Rock do. ...	2,55,652	,,	40	10,226		
Earthwork in Sidings ..	4,84,652	,,	5	2,423		
Do. do. Side and Catch Drains ...	3,96,000	,,	7	2,772		
Do. do. Nala Diversions	9,45,500	,,	4	3,782		
Service Roads and Dagbels ...	42	miles.	125	5,250		
Conservancy	42	,,	50	2,100		
Muram Soling	37	,,	1,000	37,000		
Tree plantation	4	each.	500	2,000		
Total, Rs. ...	...	...	...	...	2,49,249	
Add—Share of Engineering plant required for construction purposes	...	...	...	...	3,000	
Total Earthwork, Rs. ...	...	...	...	...	...	2,52,249

Rate per Mile, Rs.5,988.

The rate for service road includes maintenance after each monsoon.

A muram soling, 1 foot in depth, is allowed for on all black soil banks.

The tree plantation will be at stations.

Bara-Kotah Railway.

(5' 6" *Gauge.*)

Kotah State (42·13 *Miles*).

IV.—BRIDGEWORK.

1.—Large Bridge.

No. 19 *Kali Sindh River Bridge, Mile* 167·20 (12 *spans* 150 *feet Girders*).

Description of work.	Quantity.	Unit.	Rate.	Amount.	Total.	Grand Total.
			Rs.	Rs.	Rs.	Rs.
Excavation, Earth, Dry ...	706,369	% c. ft.	10	7,064		
Do. do. Wet ...	137,168	,,	25	3,429		
Do. Rock, do. ...	154,656	,,	50	7,733		
Pumping Founds, Special ...	No. 2	each.	10,000	20,000		
Do. do.	,, 6	,,	1,000	6,000		
Do. do.	,, 5	,,	300	1,500		
Concrete	49,345	% c. ft.	18	8,882		
Masonry in Founds ...	187,992	,,	60	1,12,795		
Do. in Superstructure ...	337,149	,,	60	2,02,289		
Ashlar or Coping	26,275	c. ft.	1	26,275		
Timber	2,100	,,	6	12,600		
Ironwork in Girders: English cost	1,734·3	tons.	173	2,99,943		
Do. do. Indian cost	1,734·3	,,	12	19,953		
Do. carriage to site of work	1,734·3	,,	16	27,749		
Erecting and Painting ...	1,734·3	,,	75	1,30,073		
Stone Pitching	97,400	% s. ft.	10	9,740		
Diversion.						
Earthwork in Banks & Cuttings	2,000,000	°/₀₀ c.ft.	5	10,000		
Temporary Bridge ...	Lump sum	...	...	5,000		
Total Value of Work, Rs. ...	...	...	...	...	9,11,025	
Contingencies at 5 per cent....	...	...	...	...	45,551	
Total, Rs. ...	...	...	...	...	9,56,576	
Add—Share of Engineering plant required for construction purposes	...	...	...	...	25,000	
Grand Total, Rs. ...	...	...	...	...	...	9,81,576
English Expenditure, Rs. ...	...	...	...	...	...	2,99,943
Indian ,, ,, ...	...	...	...	...	...	6,81,633

Rate per Mile, Rs.23,299.

The foundations of the bridge are let into rock, a red sandstone, which is exposed on the left bank, but covered by a stratum of clay and boulders on the right bank. Special foundations will be required in the case of two piers which will stand in some 10 to 15 feet of water in the dry season. The estimate is prepared on the assumption that rock will be met with all across at a not greater depth than is shown in the bed of the pool. The masonry will be heavy coursed rubble, approaching blocks in course, the stone being red sandstone with a lead of about two miles. Pier abutments are estimated for; but in the left bank wings will possibly be required: The road is between girders on lower boom and a footway is carried on one side of the girders. It is proposed to erect the main girders at ground-level and hoist them into position by means of a gantry frame placed on the piers.

Provision is made for a diversion which will greatly facilitate construction in bringing materials to site of work.

The clear height from highest recorded flood-level to bottom of girders is 11·20 feet. The height from river-bed to formation is 106·33 feet.

English charges are calculated on a basis of Exchange of 1*s.* 2*d.* per rupee.

Bara-Kotah Railway.

(5' 6" *Gauge.*)

Kotah State (42·13 *Miles.*)

IV.—BRIDGEWORK.

1.—Large Bridge.

No. 48 *Ahnia River Bridge, Mile* 187·19 (6 *spans* 60 *feet Girders*).

Description of work.	Quantity.	Unit.	Rate.	Amount.	Total.	Grand Total.
			Rs.	Rs.	Rs.	Rs.
Excavation, Earth, Dry ...	35,102	$^{c}/_{cc}$ c. ft.	10	351		
Do. do. Wet ...	4,637	"	25	116		
Do. Rock, do. ...	23,558	"	50	1,178		
Pumping Founds ...	No. 5	each.	300	1,500		
Concrete	7,092	$^{c}/_{c}$ c. ft.	18	1,277		
Masonry in Founds ...	18,137	"	45	8,162		
Do. in Superstructure ...	24,961	"	45	11,232		
Ashlar or Coping ...	2,246	c. ft.	1	2,246		
Timber	1,040	"	5	5,200		
Ironwork in Girders, English cost	158·08	tons.	169	26,680		
Ironwork in Girders, Indian cost	158·08	"	11	1,793		
Ironwork carriage to site of work	158·08	"	16	2,529		
Erecting and Painting ...	158·08	"	40	6,323		
Stone Pitching	12,370	$^{1}/_{c}$ c. ft.	10	1,237		
Diversion.						
Earthwork in Banks and Cuttings	900,000	$^{1}/_{c}$ c. ft.	5	4,500		
Temporary Bridge ...	Lump sum	...	...	2,000		
Total Value of Work, Rs. ...	...	...	...	...	76,324	
Contingencies at 5 per cent....	...	...	...	...	3,816	
Total, Rs. ...	...	...	...	...	80,140	
Add.—Share of Engineering plant required for construction purposes	...	...	...	...	2,500	
Grand Total, Rs. ...	...	...	...	...	...	82,640
English Expenditure, Rs. ...	...	...	...	...	...	26,680
Indian " " ...	...	...	...	...	...	55,960

Rate per Mile, Rs.1,962.

Rock is found in the bed of river into which founds will be sunk. The masonry will be coursed rubble, approaching block in course, the stone, a red sandstone, with lead a little over a mile. Pier abutments are adopted, the banks being well pitched.

The girders will be plate and the road carried on the upper boom. The clear height from highest recorded flood level to the bottom of girders is 5·06 feet. The height from river-bed to formation is 38 feet. English charges are calculated on a basis of *1s. 2d.* per rupee.

Bara-Kotah Railway.

(5' 6" Gauge.)

Kotah State (42·13 Miles).

IV.—BRIDGEWORK.

List of Minor Bridges (costing under Rs.4,000.)

A

Number.	Milenge.	Nature of Bridge.	Excavation.			Concrete.	Masonry.		Flooring.	Archwork.	Coping or Ashlar.	Slabbing.	Dry filling.	Earthwork Diversion.	Total.
			Dry Earth.	Wet Earth.	Soft Rock.		Masonry in Foundn.	Masonry in Superstructure							
2	152·78	1 Span 3' F. T. ...	2,724	...	...	1,816	262	611	...	...	42	174	1,582	...	
3	153·34	1 „ 3' „ ...	2,470	...	...	1,976	286	647	...	...	42	207	1,734	...	
4	154·41	2 „ 3' „ ...	4,070	...	...	3,256	472	951	...	...	52	541	2,190	14,000	
5	154·78	1 „ 3' „ ...	2,670	...	...	2,136	310	683	...	...	42	240	1,886	10,000	
6	155·31	2 „ 3' „ ...	4,070	...	...	3,256	472	951	...	...	52	541	1,734	88,000	
7	156·54	1 „ 3' „ ...	3,070	...	...	2,456	358	755	...	...	42	306	2,190	...	
9	158·38	1 „ 3' „ ...	2,870	...	...	2,296	334	719	...	...	42	273	2,038	...	
10	159·17	1 „ 3' „ ...	2,470	...	...	1,976	286	647	...	...	42	207	1,734	...	
11	160·01	1 „ 3' „ ...	3,270	...	...	2,616	382	791	...	...	42	339	2,342	...	
17	166·18	1 „ 3' „ ...	4,070	...	...	3,256	478	935	...	...	42	471	2,950	...	
19	168·00	1 „ 3' „ ...	3,870	...	...	3,096	454	899	...	...	42	438	2,798	...	
20	168·16	1 „ 3' „ ...	3,470	...	...	2,776	406	827	...	...	42	372	2,094	...	
22	170·17	1 „ 3' „ ...	2,870	...	...	2,296	334	719	...	...	42	273	2,038	...	
23	170·67	2 „ 3' „ ...	5,270	...	...	4,216	616	1,168	...	...	52	777	2,798	...	
24	171·09	2 „ 3' „ ...	4,020	...	...	2,296	328	735	...	...	52	305	1,582	...	
25	172·37	1 „ 3' „ ...	3,178	...	...	1,816	262	611	...	...	42	174	1,582	...	
26	174·37	2 „ 3' „ ...	3,170	...	...	2,536	364	789	..	.	52	364	1,731	...	
27	175·25	2 „ 3' „ ...	3,470	...	...	2,776	400	843	...	...	52	423	1,926	...	
28	175·43	2 „ 3' „ ...	4,670	...	...	3,736	544	1,059	...	...	52	659	2,491	...	
29	176·97	1 „ 3' „ ...	2,470	...	...	1,976	286	647	...	..	42	207	1,731	...	
31	179·05	2 „ 3' „ ...	2,870	...	...	2,296	328	735	..	...	52	305	1 582	...	
32	179·16	2 „ 3' „ ...	3,170	...	...	2,536	364	789	...	...	52	364	1,734	...	
34	180·39	2 „ 3' „ ...	3,770	...	...	3,016	436	897	...	...	52	482	2,038	7,500	
35	181·38	2 „ 3' „ ...	3,770	...	...	3,016	436	897	...	...	52	482	2,038	...	
38	183·08	1 „ 3' „ ...	2,470	...	...	1,976	286	647	...	...	42	207	1,734	..	
39	183·46	2 „ 3' „ ...	3,770	...	...	3,016	436	897	...	...	52	482	2,038	7,500	
40	184·08	1 „ 3' „ ...	2,270	...	...	1,816	262	611	...	.	42	174	1,582	...	
41	184·51	2 „ 3' „ ...	4,018	...	...	2,296	328	735	...	...	52	305	1,582	...	
42	185·42	1 „ 3' „ ...	2,270	...	...	1,816	262	611	...	...	42	172	1,582	...	
43	186·15	2 „ 3' „ ...	3,448	...	...	2,296	328	735	...	...	52	305	1,582	...	
44	186·29	2 „ 3' „ ...	4,070	...	...	3,256	472	951	...	...	52	541	2,190	...	
45	186·65	1 „ 3' „ ...	2,470	...	...	1,976	286	647	...	...	42	207	1,734	...	
		Total Quantities...	1,06,584	...	...	81,872	11,858	25,139	...	...	1,494	11,317	63,476	1,27,000	
		Rate, Rs. ...	4%	...	...	18%	3 5	35%	...	...	75%	75%	10‰	4‰	
		Amount, Rs. ...	426	...	...	14,736	4,150	8,798	...	...	1,120	8,488	635	508	38,861

Bara-Kotah Railway.

(5' 6" *Gauge.*)

Kotah State (42·13 *Miles*).

IV.—BRIDGEWORK.

*List of Minor Bridges (costing under Rs.*4,000.)

A

Number.	Mileage.	Nature of Bridge.	Excavation.			Concrete.	Masonry.		Flooring.	Archwork.	Coping or Ashlar.	Slabbing.	Dry filling.	Earthwork Diversion.	Total.
			Dry Earth.	Wet Earth.	Soft Rock.		Masonry in Founds.	Masonry in Superstructure							
2	152 78	1 Span 3' F. T. ...	2,724	...	...	1,816	262	611	...	...	42	174	1,582	...	
3	153 34	1 „ 3' „ ...	2,470	...	...	1,976	286	647	...	...	42	207	1,734	...	
4	154·41	2 „ 3' „ ...	4,070	...	...	3,256	472	951	...	...	52	541	2,190	14,000	
5	154·78	1 „ 3' „ ...	2,670	...	...	2,136	310	683	...	...	42	240	1,886	10,000	
6	155·31	2 „ 3' „ ...	4,070	...	...	3,256	472	951	...	...	52	541	1,734	88,000	
7	156·54	1 „ 3' „ ..	3,070	...	...	2,456	358	755	...	...	42	306	2,190	...	
9	158·38	1 „ 3' „ ..	2,870	...	...	2,296	334	719	...	...	42	273	2,038	...	
10	159 17	1 „ 3' „ ...	2,470	...	...	1,976	286	647	...	...	42	207	1,734	...	
11	160·01	1 „ 3' „ ...	3,270	...	...	2,616	382	791	...	...	42	339	2,342	...	
17	166·18	1 „ 3' „ ...	4,070	...	...	3,256	478	935	...	...	42	471	2,950	...	
19	168·00	1 „ 3' „ ...	3,870	...	...	3,096	454	899	...	...	42	438	2,798	...	
20	168 16	1 „ 3' „ ...	3,470	...	...	2,776	406	827	...	...	42	372	2,994	...	
22	170·17	1 „ 3' „ ...	2,870	...	...	2,296	334	719	...	...	42	273	2,038	...	
23	170·67	2 „ 3' „ ...	5,270	...	...	4,216	616	1,168	...	...	52	777	2,798	...	
24	171·09	2 „ 3' „ ...	4,026	...	...	2,296	328	735	...	...	52	305	1,582	...	
25	172·37	1 „ 3' „ ...	3,178	...	...	1,816	262	611	...	...	42	174	1,582	...	
26	174·37	2 „ 3' „ ...	3,170	...	...	2,536	364	789	...	.	52	364	1,734	...	
27	175·25	2 „ 3' „ ...	3,470	...	...	2,776	400	843	...	...	52	423	1,926	...	
28	175·43	2 „ 3' „ ...	4,670	...	...	3,736	544	1,059	...	...	52	659	2,494	...	
29	176·07	1 „ 3' „ ...	2,470	...	...	1,976	286	647	..	...	42	207	1,734	...	
31	179·05	2 „ 3' „ ...	2,870	...	...	2,296	328	735	..	...	52	305	1 582	...	
32	179·16	2 „ 3' „ ...	3,170	...	...	2,536	364	789	...	...	52	364	1,734	...	
34	180·39	2 „ 3' „ ...	3,770	...	...	3,016	436	897	...	...	52	482	2,038	7,500	
35	181·38	2 „ 3' „ ...	3,770	...	...	3,016	436	897	...	...	52	482	2,038	...	
38	183·08	1 „ 3' „ ...	2,470	...	...	1,976	286	647	...	...	42	207	1,734	...	
39	183·46	2 „ 3' „ ...	3,770	...	...	3,016	436	897	...	...	52	482	2,038	7,500	
40	184·08	1 „ 3' „ ...	2,270	...	...	1,816	262	611	...	.	42	174	1,582	...	
41	184 51	2 „ 3' „ ...	4,018	...	...	2,296	328	735	...	...	52	305	1,582	...	
42	185·42	1 „ 3' „ ...	2,270	...	...	1,816	262	611	...	...	42	172	1,582	...	
43	186·15	2 „ 3' „ ...	3,448	...	...	2,296	328	735	...	...	52	305	1,582	...	
44	186·29	2 „ 3' „ ...	4,070	...	...	3,256	472	951	...	...	52	541	2,190	...	
45	186·65	1 „ 3' „ ...	2,470	...	...	1,976	286	647	...	...	42	207	1,734	...	
		Total Quantities...	1,06,584	...	...	81,872	11,858	25,139	...	...	1,494	11,317	63,476	1,27,000	
		Rate, Rs. ...	4‰	...	...	18%	3 5	35%	...	...	75%	75%	10‰	4‰	
		Amount, Rs. ...	426	...	...	14,736	4,150	8,798	...	...	1,120	8,488	635	508	38,861

Bara-Kotah Railway.

(5' 6" Gauge.)

Kotah State (42·13 Miles.)

IV.—BRIDGEWORK.

2.—Minor Bridges (costing over Rs.4,000.)

Number	Mileage	Nature of Bridges.	Excavation. Dry Earth.	Excavation. Wet Earth.	Excavation. Soft Rock.	Concrete.	Masonry. Masonry in Foundations.	Masonry. Masonry in Superstructure.	Facing.	Arching.	Coping and Ashlar.	Shafting.	Dry Filling.	Earthwork Diversion.	Total.
															Rs.
1	150·75	3 spans 20' Arch	28,115	...	...	5,631	22,752	22,417	8,553	6,701	333	...	29,303	...	
8	156·08	3 " 20' "	22,375	...	...	4,473	10,293	16,020	7,623	3,723	333	...	21,110	1,33,000	
12	161·74	3 " 12' "	13,175	...	...	3,360	9,817	8,813	3,170	3,131	213	...	8,236	1,20,000	
13	162·41	3 " 12' "	7,612	7,612	...	3,114	9,353	7,811	3,316	2,783	213	..	7,776	...	
14	162·77	2 " 6' "	7,151	...	.	2,153	2,66[illegible]	2,781	811	911	116	.	2,510	56,000	
15	163·05	5 " 20' "	..	..	21,332	5,615	13,526	22,037	12,281	7,116	433	...	25,432	...	
16	165·65	1 " 12' "	12,716	..	..	2,517	7,023	1,600	1,871	1,312	151	..	9,616	63,000	
21	168·12	1 " 12' "	12,221	..	...	2,605	7,331	6,281	1,513	1,271	151	..	9,216	...	
30	177·33	2 " 12' "	10,933	...	...	2,735	7,927	6,6[illegible]	2,357	1,536	182	..	7,776	31,000	
33	179·57	3 " 20' "	...	.	17,412	4,475	10,276	16,62[illegible]	7,623	3,723	333	...	21,116	...	
36	181·66	1 " 12' "	...	...	6,112	2,115	3,567	5,642	1,117	1,011	151	...	5,256	...	
37	181·80	3 " 12' "	..	...	7,572	3,140	5,018	7,801	3,316	2,783	213	...	7,776	75,000	
		Total Quantities ..	1,11,677	7,612	52,725	42,26[illegible]	1,10,432	1,30,813	53,092	31,7[illegible]	2,822	...	1,64,311	4,50,000	
		Rate, Rs. ..	4%	10%	25%	15%	35%	35%	30%	75%	75%	...	10%	4%	
		Amount, Rs. ..	446	76	1,318	7,018	41,801	45,702	11,167	27,576	2,116	...	1,643	1,023	
		Total, Rs..	...	...	...	...	...	...	..	...	..	...	...	..	1,46,600

	Total Rupees ..	1,46,600
Add—For minor bridges (costing under Rs.4,000) as per list A	... ...	38,861
	Total Rupees ...	1,85,461
Add—Contingencies at 5 per cent.	... ...	9,273
	Total Rupees ...	1,94,734
Add—Share of Engineering plant required for construction purposes	... ...	2,500
	Grand Total ...	1,97,234

Rate per Mile, Rs 4,681.

All minor bridges are slab top or arched. The masonry will be of superior coursed rubble.

Bará-Kotah Railway.

(5' 6" Gauge.)

Kotah State (42·13 Miles).

IV.—BRIDGEWORK.

List of Minor Bridges (costing under Rs.4,000.)

A

Number.	Mileage.	Nature of Bridge.	Excavation.			Concrete.	Masonry.		Flooring.	Archwork.	Coping or Ashlar.	Slabbing.	Dry filling.	Earthwork Diversion.	Total.
			Dry Earth.	Wet Earth.	Soft Rock.		Masonry in Founds.	Masonry in Superstructure							
2	152·78	1 Span 3' F. T. ...	2,724	...	...	1,816	262	611	...	...	42	174	1,582	...	
3	153·34	1 „ 3' „ ...	2,470	...	...	1,976	286	647	...	...	42	207	1,734	...	
4	154·41	2 „ 3' „ ...	4,070	...	...	3,256	472	951	...	...	52	541	2,190	14,000	
5	154·78	1 „ 3' „ ...	2,670	...	...	2,136	310	683	...	...	42	240	1,886	10,000	
6	155·31	2 „ 3' „ ...	4,070	...	...	3,256	472	951	...	...	52	541	1,734	88,000	
7	156·54	1 „ 3' „ ...	3,070	...	...	2,456	358	755	...	...	42	306	2,190	...	
9	158·38	1 „ 3' „ ...	2,870	...	...	2,296	334	719	...	...	42	273	2,038	...	
10	159·17	1 „ 3' „ ...	2,470	...	...	1,976	286	647	...	...	42	207	1,734	...	
11	160·01	1 „ 3' „ ...	3,270	...	...	2,616	382	791	...	...	42	339	2,342	...	
17	166·18	1 „ 3' „ ...	4,070	...	...	3,256	478	935	...	...	42	471	2,950	...	
19	168·00	1 „ 3' „ ...	3,870	...	...	3,096	454	899	...	...	42	438	2,798	...	
20	168·16	1 „ 3' „ ...	3,470	...	...	2,776	406	827	...	...	42	372	2,094	...	
22	170·17	1 „ 3' „ ...	2,870	...	...	2,296	334	719	...	...	42	273	2,038	...	
23	170·67	2 „ 3' „ ...	5,270	...	...	4,216	616	1,168	...	...	52	777	2,798	...	
24	171·09	2 „ 3' „ ...	4,020	...	...	2,296	328	735	...	...	52	305	1,582	...	
25	172·37	1 „ 3' „ ...	3,178	...	...	1,816	262	611	...	...	42	174	1,582	...	
26	174·37	2 „ 3' „ ...	3,170	...	...	2,536	364	789	...	...	52	364	1,734	...	
27	175·25	2 „ 3' „ ...	3,470	...	...	2,776	400	843	...	...	52	423	1,926	...	
28	175·43	2 „ 3' „ ...	4,670	...	...	3,736	544	1,059	...	...	52	659	2,494	...	
29	176·97	1 „ 3' „ ...	2,470	...	...	1,976	286	647	...	...	42	207	1,734	...	
31	179·05	2 „ 3' „ ...	2,870	...	...	2,296	328	735	...	...	52	305	1,582	...	
32	179·16	2 „ 3' „ ...	3,170	...	...	2,536	364	789	...	...	52	364	1,734	...	
34	180·39	2 „ 3' „ ...	3,770	...	...	3,016	436	897	...	...	52	482	2,038	7,500	
35	181·38	2 „ 3' „ ...	3,770	...	...	3,016	436	897	...	...	52	482	2,038	...	
38	183·08	1 „ 3' „ ...	2,470	...	...	1,976	286	647	...	...	42	207	1,734	...	
39	183·46	2 „ 3' „ ...	3,770	...	...	3,016	436	897	...	...	52	482	2,038	7,500	
40	184·08	1 „ 3' „ ...	2,270	...	...	1,816	262	611	...	...	42	174	1,582	...	
41	184 51	2 „ 3' „ ...	4,018	...	...	2,296	328	735	...	...	52	305	1,582	...	
42	185·42	1 „ 3' „ ...	2,270	...	...	1,816	262	611	...	...	42	172	1,582	...	
43	186·15	2 „ 3' „ ...	3,448	...	...	2,296	328	735	...	...	52	305	1,582	...	
44	186·29	2 „ 3' „ ...	4,070	...	...	3,256	472	951	...	...	52	541	2,190	...	
45	186·65	1 „ 3' „ ...	2,470	...	...	1,976	286	647	...	...	42	207	1,734	...	
		Total Quantities...	1,06,584	...	...	81,872	11,858	25,139	...	...	1,494	11,317	63,476	1,27,000	
		Rate, Rs. ...	4%	...	...	18%	3 5	35%	...	...	75%	75%	10%	4%	
		Amount, Rs. ...	426	...	...	14,736	4,150	8,798	...	...	1,120	8,488	635	508	38,861

Bara-Kotah Railway.

(5' 6" Gauge.)

Kotah State (42·13 Miles).

V.—FENCING, &c.

1.—Fencing.

Description of work.	Quantity.	Unit.	Rate.	Amount.	Total.
			Rs.	Rs.	Rs.
Fencing Main Line	84·26	mile.	1,591	1,34,057	
Extra for Station-yards	1·25	„	1,591	1,989	
Extra for Level crossings and Bridge-approaches	·50	„	1,591	796	
Boundary Pillars	42·13	„	25	1,053	
Total Fencing, Rs. ...	...	...	...	...	1,37,895
English Expenditure, Rs.	...	...	...	...	1,02,788
Indian „ „	...	...	...	...	35,107

Rate per Mile, Rs.3,273.

For details of one mile of single fencing, see Appendix B.

This Estimate provides for cost of fencing throughout. Stone boundary pillars at Re.1 each, 25 to the mile, are provided to mark the land taken up permanently for the use of the Railway.

The type of fencing will be the same as used on Goona-Bina Railway.

English charges are calculated on a basis of 1*s.* 2*d.* per rupee.

2.—Road Crossings.

Description of work.	Quantity.	Unit.	Rate.	Amount.	Total.
			Rs.	Rs.	Rs.
Level Crossing, Class A.	2	each.	1,000	2,000	
Do. do. do. B.	4	„	800	3,200	
Do. do. do. C.	26	„	150	3,900	
Total Road Crossings, Rs. ...	...	...	...		9,100

Rate per Mile, Rs.216.

Under Class A provision is made for a gate-lodge, gate-guard, rails, and earthwork and metalling of approaches.

Class B is the same as Class A with post and chains in place of gates.

Under Class C, provision is only made for posts and chains, guard-rails and earthwork in approaches.

Bara-Kotah Railway.

(5' 6" *Gauge.*)

Kotah State (42·13 *Miles*).

V.—FENCING.

3.—Mile and Gradient Posts.

Description of work.	Quantity.	Unit.	Rate.	Amount.	Total.
			Rs.	Rs.	Rs.
Mile Posts	42	each.	7	294	
Gradient Posts	56	„	10	560	
Numbering Telegraph Posts ...	42·13	miles.	20	843	
Total Mile and Gradient Posts, Rs. ...	...	...	...	...	1,697

Rate per Mile, Rs.40.

Mile posts will be of stone slabs.

Gradient posts will consist of galvanized iron arms, with stencil lettering fixed to old rail standards.

VI.—ELECTRIC TELEGRAPH.

Description of work.	Quantity.	Unit.	Rate.	Amount.	Total.
			Rs.	Rs	Rs.
Fittings for Telegraph Offices at Stations	3	station.	500	1,500	
Do. do. do. do.	1	„	1,000	1,000	
Total Electric Telegraph, Rs. ...	...	...	...	...	2,500

Rate per Mile, Rs.59.

This Estimate allows for fittings of Telegraph Offices only, the cost of provision of Telegraph lines being borne by the Telegraph Department, Government of India.

Provision is made under General Charges XII.,—Engineering Office Expenses for cost of rent and maintenance during construction.

Bara-Kotah Railway.

(5' 6" *Gauge.*)

Kotah State (42·13 *Miles*).

VII.—BALLAST AND PERMANENT-WAY.

1.—Ballast.

Description of work.	Quantity.	Unit.	Rate.	Amount.	Total.
			Rs.	Rs.	Rs.
Ballast, Main Line	42·13	mile.	4,086	1,72,143	
Do. Station Siding	3·00	,,	4,086	12.258	
Total Ballast, Rs.	...	...	...	...	1,84.401
Add—Share of Engineering plant	...	...	...	...	3,500
Grand Total, Rs.	...	...	...	...	1,87,901

Rate per Mile, Rs.4,460.

The section allowed for, is 17·2 sq. ft. or 90,816 c. ft. per mile estimated to cost on an average of Rs.4½ per cent. c. ft.

2.—Permanent-way.

Description of work.	Quantity.	Unit.	Rate.	Amount.	Total.	Grand Total.
			Rs.	Rs.	Rs.	Rs.
Permanent-way, Main Line	42·13	mile.	28,410	11,96,913		
Do. Station Sidings	3·00	,,	28,410	85,230		
Laying and Lifting Diversions	42·13	,,	100	4,213		
Maintenance of Track for one year	45·13	,,	300	13,539		
Total, Rs. ...	...	...	...	...	12,99,895	
Add—Share of Engineering plant	...	...	...	...	7,000	
Total Permanent-way, Rs.	...	...	...	...	...	13.06.895
English Expenditure, Rs....	...	...	...	...	...	4.99.509
Indian ,, ,, ...	...	...	...	...	...	8,07,386

Rate per Mile, Rs.31,020.

For details of one mile of Permanent-way, see Appendix D.

The Permanent-way estimated for consists of 75lbs. steel rails, flat-footed 30 feet long, carried on sal sleepers $9\frac{1}{2}' \times 10'' \times 5''$. The fish-plate is the new I. S. R. standard pattern with 4 holes, weighing 32lbs. per pair, and the fish-bolts $5\frac{3}{8}''$ long and 1 inch diameter. A rate of Exchange of Re.1 = 1*s.* 2*d.* has been taken.

A through rate of Rs.100 per mile is allowed for diversions, as it is not known at present where these may be necessary to facilitate plate-laying.

One and a-half miles of Permanent-way are provided for Kotah Station-yard and half a mile for each of the three wayside stations.

Bara-Kotah Railway.

(5′ 6″ *Gauge.*)

Kotah State (42·13 *Miles*).

VIII.—STATIONS AND BUILDINGS.

1.—Stations and Offices.

Stations.	Station Buildings.	Passenger-platform.	Palisading & Gates.	Goods platform.	Goods shed.	Latrine.	Name-board.	Approach-road.	Amount.	Total.
									Rs.	Rs.
Tara ...	5,000	2,100	1,500	...	...	650	100	500	9,850	
Antha ...	5,000	2,100	1,500	3,000	3,500	650	100	500	16,350	
Kararia ...	5,000	2,100	1,500	...	...	650	100	500	9,850	
Kotah ...	15,000	6,000	1,500	6,000	3,500	650	100	2,000	34,750	
Total Stations & Offices ...	...	...	...	...	...	...	...	...	70,800	

Rate per Mile, Rs.1,680.

The station accommodation consists of a Ticket Office 16′ × 16′, a Lamp and Store-room each 8′ × 7′ and a Waiting-shed for 3rd class passengers, 27′ × 18′. Provision has been made for a 2nd class station at Kotah, but it is proposed at first to erect a temporary station building only.

The Passenger-platform will be 600 feet long and 50 feet wide with curbstone 12′ × 12′ boxed up by ballast to form a platform wall.

At Kotah a platform wall up to full height is estimated for.

Goods-sheds are allowed for at Antha and Kotah, but will not be built till necessity requires.

3.—Staff Quarters.

Description of work.	Tara.		Antha.		Kararia.		Kotah		Total.	Grand Total.
	Number of Units.	Amount.	Number of Units.	Amount.	Number of Units.	Amount.	Number of Units.	Amount.		
		Rs.		Rs.		Rs.		Rs.	Rs.	Rs.
Station Master's and Signaller's Quarters.	2	2,000	3	3,000	2	2,000	3	3,000	10,000	
Menials' and Police Quarters ..	6	1,500	8	2,000	6	1,500	14	3,500	8,500	
Permanent-way Inspector's Quarters	..	..	..	..	..	..	1	3,500	3,500	
Running-room	..		..	..	..	..	1	3,500	3 500	
Drinking Well, 6 ft. diameter ..	1	500	..	..	1	500	1	500	1,500	
	..	4,000	..	5,000	..	4,000	..	14,000	27,000	
Gangmen's Quarters.. ..	..	..	..	..	..	..	..	..	14,000	
										41,000

Rate per Mile, Rs.973.

The Station Master's quarters will consist of two main rooms 12′ × 10′ with verandah, back and front and a courtyard.

The Signaller will have one main room with verandah and courtyard.

Gangmen's quarters of 4 units, at every third mile, are estimated for.

The Permanent-way Inspector's quarters and Running-room will each consist of a three-roomed cottage with main rooms 16′ × 14′ and the usual small rooms and 9-feet verandah.

Bara-Kotah Railway.

(5' 6" *Gauge.*)

Kotah State (42·13 *Miles*).

VIII.—STATIONS AND BUILDINGS.

4.—Station Machinery.

Description.	Bara.		Tara.		Antha.		Kararia.		Kotah.		Total.
	No.	Amount.	No.	Amount.	No.	Amount.	No.	Amount	No.	Amount.	
		Rs.		Rs.		Rs.		Rs.		Rs.	
Points and Crossings	..	..	3	1,350	3	1,350	3	1,350	9	4,500	
Home and Distant Signals ..	1	1,000	3	2,200	3	2,200	3	2,200	2	1,500	
Scotch-blocks	..	..	1	25	1	25	1	25	5	125	
Buffer-stops	..	..	1	100	1	100	1	100	5	500	
Weighing-machine ..	..	..	1	275	1	275	1	275	2	550	
Dating-press	..	..	1	50	1	50	1	50	1	50	
Well, 12 feet	..	..	..	..	1	2,500	..	..	1	2,500	
Water-tank	..	..	..	..	1	3,800	..	..	1	3,800	
Ashpits	..	..	..	..	2	3,000	..	..	2	3,000	
Piping, 8 inches	..	..	..	..	1,000	3,000	..	..	1,000	3,000	
Water-columns	..	..	..	..	2	2,000	..	..	2	2,000	
Water-lift	..	..	..	..	1	500	..	..	1	500	
Engine-shed	..	..	..	..	..	..	..	..	1	5,000	
Turntable	..	..	..	..	..	..	..	..	1	11,000	
Total, Rs. ..	..	1,000	..	4,000	..	18,800	..	4,000	..	38,025	65,825
English Expenditure, Rs. ..	..	..	..	..	..	..	..	..	..	..	22.273
Indian „ „ ..	..	..	..	..	..	..	..	..	..	..	43.552

Rate per Mile, Rs.1,563.

For each 3rd class station two—1 in 12 and one 1 in $8\frac{1}{2}$—crossings are allowed for. The Signals will be wrought-iron lattice, the Home Signal being 30 feet and the Distant Signal 20 feet above ground level.

The Tank-house will be of rubble masonry with an upper and lower room for accommodation of pumping-staff.

The Tank will be of wrought-iron 24′×16′×4′.

The Ashpits will be 60 feet long.

Two Water-columns are estimated for at roadside watering-stations.

The C. I. piping will be arranged for locally in India. The usual old rail charsa frame will be used. A Turntable and a temporary Engine-shed are allowed for at Kotah.

The English charges are calculated on a basis of Exchange of *1s. 2d.* per rupee.

Bara-Kotah Railway.

(5' 6" Gauge.)

Kotah State (42·13 Miles).

IX.—PLANT.

1.—Engineering.

Description of work.	Quantity.	Unit.	Rate.	Amount.	Total.
			Rs.	Rs.	Rs.
Trollies and Maintenance tools ...	45·13	mile.	50	2,257	
Total Engineering, Rs. ...	...	...	...	...	2,257

Rate per Mile, Rs.54.

Under this head provision only has been made for tools and plant for maintenance purposes, required by the Engineering Department of the Open Line.

2.—Station and Office Furniture.

Description of work.	Quantity.	Unit.	Rate.	Amount.	Total.
			Rs.	Rs.	Rs.
2nd Class Station	1	station.	2,500	2,500	
3rd Class Stations	3	,,	1,000	3,000	
Running-room	1	,,	500	500	
Total Station & Office Furniture...	...	,,	...	...	6,000

Rate per Mile, Rs.142.

Bara-Kotah Railway.

(5' 6" Gauge.)

Kotah State (42·13 Miles).

XII.—GENERAL CHARGES.

Abstract.

Class.	Salary and Allowances. A.	Temporary Quarters. B.	Office Accommodation C.	Instruments. D.	Office Expenses. E.	Total.	Rate per Mile.
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
1. Direction ...	32,566	...	...	126	4,200	36,892	876
2. Engineering ...	1,30,968	18,450	2,500	2,178	8,400	1,62,496	3,857
3. Stores	6,572	200	1,500	...	420	8,692	206
4. Audit and Accounts	10,701	...	...	...	840	11,541	274
5. Medical and Sanitation	9,750	2,450	...	500	1,680	14,380	341
Total, Rs. ...	1,90,557	21,100	4,000	2,804	15,540	2,34,001	5,554

Rate per Mile, Rs.5,554.

Bara-Kotah Railway.

(5' 6" *Gauge.*)

Kotah State (42·13 *Miles*).

List of Articles required from England.

Description.	Quantity.	English Cost.			Rate of Exchange.	English Cost	Indian Charges.	Total.
		F.O.B.	4th Freight.	Total.				
		£	£	£		Rs.	Rs.	Rs.
Girders for Major Bridges ...	1892·38 tons.	17,201	1,852	19,053	1s 2d = 17·1429 rupees per £ Sterling.	3,26,623	21,746	3,48,369
Fencing	86 miles	5,281	715	5,996		1,02,788	7,970	1,10,758
Permanent-way ...	45·13 „	25,983	3,155	29,138		4,99,509	28,992	5,28,501
Station Machinery ...	...	1,217	73	1,290		22,114	1,226	23,340
Total ...	...	49,682	5,795	55,477		9,51,034	59,934	10,10,968

BARA-KOTAH RAILWAY.

(Metre-Gauge.)

ESTIMATES.

Bara-Kotah Railway.

(Metre-Gauge.)

Kotah State (42·13 Miles.)

ABSTRACT.

HEADS OF ACCOUNT.	TOTAL COST IN RUPEES.			
	MINOR HEADS.		MAIN HEADS.	
	Total cost.	Rate per mile.	Total cost.	Rate per mile.
	Rs.	Rs.	Rs.	Rs.
I.—Preliminary Expenses—			14,745	350
1. Survey Expenses ..	1,685	40		
2. Plant ..	1,053	25		
3. Establishment ..	12,007	285		
II.—Land—			2,107	50
III.—Formation—			2,18,837	5,194
1. Earthwork ..	2,18,837	5,194		
2. Tunnels ..	..	..		
IV.—Bridgework—			11,83,607	28,035
1. Large Bridges ..	9,[illegible]	23,721		
2. Minor Bridges ..	1,[illegible]	1,313		
V.—Fencing—			1,48,692	3,529
1. Fencing ..	1,[illegible]	3,211		
2. Road Crossings ..	[illegible]	240		
3. Mile and Gradient Posts	[illegible]	77		
VI.—Electric Telegraph ..			2,509	59
VII.—Ballast and Permanent-way—			8,94,055	21,222
1. Ballast ..	1,16,[illegible]	2,755		
2. Permanent-way ..	7,77,[illegible]	18,467		
VIII. Stations and Buildings—			1,97,560	4,689
1. Stations and Offices ..	7[illegible]	1[illegible]		
2. Workshops, Store Houses & Sheds				
3. Residences ..	13,[illegible]	[illegible]		
4. Platforms, Sheds ..	[illegible]	[illegible]		
IX.—Plant—			8,354	198
1. Engineering ..	2,[illegible]	55		
2. Station and Office Furniture ..	6,[illegible]	143		
X.—Steam Ferries—				
XI.—Rolling-Stock—			5,83,652	13,840
1. Locomotives ..	2,21,[illegible]	5,251		
2. Carriage and Wagons ..	3,62,[illegible]	8,589		
XII. General Charges—			2,34,001	5,554
1. Law Charges ..	1[illegible]	[illegible]		
2. Establishment ..	1,[illegible]	[illegible]		
3. Stores ..	[illegible]	[illegible]		
4. Audit and Accounts ..	11,[illegible]	271		
5. Medical and Sanitation ..	11,[illegible]	271		
Total cost, Rs. ..		..	34,87,570	
Length in Miles .. 42·13		..		
Total Rate per Mile, Rs. ..		..		82,781

H. B. TAYLOR, M.I.C.E.,

Engineer-in-Chief,

Gwalior-Indore Railway.

Bara-Kotah Railway.

(Metre-Gauge.)

Kotah State (42·13 Miles.)

I.—PRELIMINARY EXPENSES.

Description of work.	Quantity.	Unit.	Rate.	Amount.	Total
			Rs.	Rs.	Rs.
1. Survey expenses	42·13	mile.	40	1,685	
2. Plant	42·13	,,	25	1,053	
3. Establishment	42·13	,,	285	12,007	
					14,745

Rate per Mile, Rs.350.

For detail Estimate see Appendix A.

This Estimate has already received sanction by the Government of India—*vide* letter No. 328-R.C., dated Calcutta, 10th March, 1896, from the Government of India, Public Works Department, Railway Construction, to the Agent, Governor-General, in Central India.

II.—LAND.

Description of work.	Quantity.	Unit.	Rate.	Amount.	Total.
			Rs	Rs.	Rs.
Compensation for damage to private property	42·13	mile.	50	2,107	
					2,107

Rate per Mile, Rs.50.

Land will be provided free.

Bara-Kotah Railway.

(*Metre-Gauge.*)

Kotah State (42·13 *Miles*).

III.—FORMATION.

1.—Earthwork.

Sub-heads.	Quantity.	Unit.	Rate.	Amount.	Total.	Grand Total.
			Rs.	Rs.	Rs.	Rs
Earthwork in Banks ...	12,903,740	‰ ft.	4	51,615		
Do. do. ...	10,219,986	,,	6	61,320		
Do. do. ...	3,868,530	,,	10	38,686		
Do. in Cuttings ...	1,523,947	,,	5	7,620		
Hard Rock do. ...	227,492	,,	40	9,100		
Earthwork in Sidings ...	398,286	,,	5	1,992		
Do. do. Catch-drains ...	396,000	,,	7	2,772		
Do. do. Nala diversion...	945,500	,,	4	3,782		
Service Road and Dagbels ...	42	mile.	125	5,250		
Conservancy	42	,,	50	2,100		
Muram soling	37	,,	800	29,600		
Tree plantations ...	4	each.	500	2,000		
Total, Rs. ...	...	...	...	...	2,15,837	
Add—Share of Engineering plant required for construction purposes ...	...	...	...	...	3,000	
Total Earthwork, Rs. ...	...	...	...	...	...	2,18,837

Rate per Mile, Rs.5,194.

The rate for service road includes maintenance after each monsoon.

A muram soling, one foot depth, is allowed for on all black-soil banks.

The tree plantation will be at stations.

Bara-Kotah Railway.

(Metre-Gauge.)

Kotah State (42·13 Miles).

IV.—BRIDGEWORK.

1.—Large Bridges.

No. 19. Kali Sindh River Bridge, Mile 167·20 (12 spans 150 feet Girders).

Description of work.	Quantity	Unit.	Rate.	Amount.	Total.	Grand Total.
			Rs.	Rs.	Rs.	Rs.
Excavation, Earth, Dry ...	706,369	°/₀₀ c. ft	10	7,064		
Do. do., Wet ...	137,168	,,	25	3,429		
Do. Rock, do. ...	154,656	,,	50	7,733		
Pumping Founds, Special ...	No. 2	each.	10,000	20,000		
Do. do. ...	,, 6	,,	1,000	6,000		
Do. do. ...	,, 5	,,	300	1,500		
Concrete	49,345	°/₀ c. ft.	18	8,882		
Masonry in Founds ...	187,992	,,	60	1,12,795		
Do. in Superstructure	337,149	,,	60	2,02,289		
Ashlar or Coping ...	26,275	c. ft.	1	26,275		
Timber	2,100	,,	6	12,600		
Ironwork in Girders, English cost	1,514·15	ton.	178	2,68,954		
Do. do., Indian cost	1,514·15	,,	11	15,845		
Ironwork carriage to site of work	1,514·15	,,	16	24,224		
Erecting and Painting ...	1,514·15	,,	75	1,13,560		
Stone Pitching ...	97,400	% s. ft.	10	9,740		
Diversion.						
Earthwork in Banks and Cuttings	2,000,000	°/₀₀ c. ft.	5	10,000		
Temporary Bridge ...	Lump sum	...	...	5,000		
Total Value of Work...	...	...	...	...	8,55,890	
Contingencies at 5 per cent.	...	...	...	...	42,795	
Total, Rs. ...	...	...	...	...	8,98,685	
Add—Share of Engineering plant required for construction purposes ...	...	...	...	...	25,000	
Grand Total, Rs. ...	...	...	...	...	...	9,23,685
English Expenditure, Rs. ...	...	...	...	...	...	2,68,954
Indian ,, ,, ...	...	...	...	...	...	6 54.731

Rate per Mile, Rs.21,925.

The foundations of the bridge are let into rock, a red sandstone, which is exposed on the left bank, but covered by a stratum of clay and boulders on the right bank. Special foundations will be required in the case of two piers, which will stand in some 10 to 15 feet of water in the dry season. The estimate is proposed on the assumption that rock will be met with all across at a not greater depth than is shown in the bed of the pool. The masonry, which is designed to take standard-gauge girders, will be heavy coursed rubble, approaching block in course, the stone being red sandstone, with a lead of about two miles. Pier abutments are estimated for; but on the left bank wings will possibly be required. The road is between girders on lower boom and a footway is carried on one side of the girder. It is proposed to erect the main girders at ground-level and hoist them into position by means of a gantry-frame placed on the piers.

Provision is made for a diversion which will greatly facilitate construction in bringing materials to site of work.

The clear height from highest recorded flood-level to bottom of girders is 11·20 feet. The height from river-bed to formation is 106·33 feet.

English charges are calculated on a basis of Exchange 1*s.* 2*d.* per rupee.

Bara-Kotah Railway.

(*Metre-Gauge*).

Kotah State (42 13 *Miles*).

IV.—BRIDGEWORK.

1.—Large Bridges.

No. 48. *Almia River Bridge, Mile* 187·19 (6 *spans* 60 *feet Girders*).

Description of work.	Quantity.	Unit.	Rate.	Amount.	Total.	Grand Total.
			Rs.	Rs.	Rs.	Rs.
Excavation, Earth, Dry ...	35,102	°/₀₀ c.ft.	10	351		
Do. do. Wet ...	4 637	,,	25	116		
Do. .. Rock, do. ..	23,558	,,	50	1,178		
Pumping Founds ...	No. 5	each.	300	1,500		
Concrete ...	7,092	°/₀ c.ft.	18	1,277		
Masonry in Founds ...	18.137	,,	45	8,162		
Do. in Superstructure ...	24,961	,,	45	11,232		
Ashlar or Coping ...	2,246	c. ft.	1	2,246		
Timber	520	,,	5	2,600		
Ironwood in girders, English cost...	127·5	ton.	113	24,463		
Do. do. Indian do. ...	127·5	,,	13	1,696		
Do. carriage to site of work ...	127·5	,,	16	2,040		
Erecting and Painting ...	127·5	,,	40	5,100		
Stone Pitching ...	12,370	°/₀ c.ft.	10	1,237		
Diversion.						
Earthwork in Banks & Cuttings ...	900,000	°/₀₀ ft.	5	4,500		
Temporary Bridge ...	Lump	sum	...	2,000		
Total Value of Work, Rs. ...	...	...	...	...	69,698	
Contingencies @ 5 per cent. ...	...	...	...	...	3,485	
Total, Rs. ...	...	...	...	...	73,183	
Add—Share of Engineering plant required for construction purposes	...	...	...	...	2,500	
Grand Total, Rs. ...	...	...	...	...		75,683
English Expenditure, Rs. ...	...	...	...	...		24,463
Indian ,, ,, ...	...	...	...	...		51,220

Rate per Mile, Rs.1,796.

Rock is found in the bed of river into which Founds will be sunk. The masonry which is designed to take standard-gauge girders will be coursed rubble, approaching block in course. The stone, a red sandstone, with lead a little over a mile. Pier abutments are adopted, the banks being well pitched.

The girders will be plate and the road carried on the upper boom.

The clear height from highest recorded flood-level to the bottom of girders is 5·06 feet.

The height from river-bed to formation is 38 feet.

English charges are calculated on a basis of 1*s.* 2*d.* per rupee.

Bara-Kotah Railway.

(*Metre-Gauge.*)

Kotah State (42 13 *Miles*).

IV.—BRIDGEWORK.

2.—Minor Bridges (costing over Rs.4,000.)

Number.	Mileage.	Nature of Bridges	Excavation			Concrete.	Masonry.		Flooring	Archwork.	Coping or Ashlar.	Pitching.	Dry Filling	Earthwork Diversion.	Total.
			Dry Earth.	Wet Earth	Soft Rock.		Masonry in Founds.	Masonry S. S.							
															Rs
1	150'78	3 Spans 20' Arch ..	33,882	...	...	5,387	21,803	21,008	8,343	5,956	333	..	28,070	...	...
8	156'78	3 „ 20' „ ..	27,502	...	...	4,171	16,309	15,169	7,383	2,979	333	..	22,790	13,508	...
12	161'74	3 „ 12' „ .	15,284	...	...	3,149	9,363	7,891	3,346	2,783	213	.	7,776	1,20,000	...
13	162'41	3 „ 12' „ ...	14,104	...	...	2,920	8,879	7,299	3,202	2,435	213	..	7,296	...	...
15	163'98	5 „ 20' „ ...	...	...	21,332	5,615	13,526	22,936	12,249	7,446	433	..	2,540	...	...
16	165'65	1 „ 12 „ ...	12,221	.	...	2,603	7,339	6,281	1,513	1,276	151	.	9,216	60,000	...
21	168'42	1 „ 12' „ ...	11,724	..	...	2,569	7,055	5,163	1,465	1,159	151	.	8,736	...	...
30	177'35	2 „ 12' „ ...	12,321	...	...	2,563	7,542	6,152	2,261	1,623	182	..	7,296	34,000	...
33	179'87	3 „ 20' „ ..	...	...	16,500	4,171	9,818	15,169	7,383	2,979	333	.	22,790	...	...
36	181'66	1 „ 12' „ ...	...	...	6,708	2,321	3,425	5,325	1,369	926	151	.	7,776	...	...
37	181'89	3 „ 12' „ ...	...	...	9,003	2,929	4,776	7,299	3,202	2,435	213	..	7,296	75,000	...
		Total quantities ...	1,27,338	...	53,543	38,497	1,11,925	1,20,492	51,756	31,999	2,706	...	1,31,582	3,02,508	...
		Rates, Rs. ...	4°/co	...	25°/co	18%	35°/o	35° o	30°/o	75°/o	75°/o	...	10°/co	4°/co	...
		Amount, Rs. ..	509	...	1,339	6 920	39,173	42,172	15 527	23,999	2,029	..	1,316	1,210	1,34 203
													Total Rupees ...		1,34,203
Add—For Minor Bridges costing under Rs.4,000 as per list A							...	...	...	...			...	...	38,882
													Total Rupees ...		1,73,085
Add—Contingencies @ Rs.5 per cent.							...	...	...	...			...	...	8,654
													Total Rupees ...		1,81,739
Add—Share of Engineering Plant required for construction purposes							...	...	...				...	...	2,500
													Grand Total, Rs. ...		1,84,239

Rate per Mile, Rs.4,373.

All Minor Bridges are slab top or arched. The masonry will be of superior coursed rubble.

Bara-Kotah Railway.

(Metre-Gauge.)

Kotah State (42·13 Miles).

IV.—BRIDGEWORK.

2.—Minor Bridges (costing under Rs.4,000.)

A.

Number.	Mileage.	Nature of Bridges.	Excavation.			Concrete.	Masonry.		Flooring.	Arch-work.	Coping or Ashlar.	Slabbing.	Dry Filling.	Earthwork Diversion.	Total.
			Dry Earth.	Wet Earth.	Soft Rock		Masonry in Foundns.	Masonry in S. S							
2	152·76	1 Span 3' F. T.	2,484	...	...	1,656	238	575	...	...	42	141	1,430	...	
3	153·34	1 „ 3' „	2,270	...	...	1,816	262	611	...	...	42	172	1,582	...	
4	154·41	2 „ 3' „	3,770	...	...	3,016	436	397	...	...	52	482	2,038	14,000	
5	154·78	1 „ 3' „	2,470	...	...	1,976	286	647	...	...	42	207	1,734	10,000	
6	155·31	2 „ 3' „	3,770	...	...	3,016	436	897	...	...	52	482	2,038	88,000	
7	156·54	1 „ 3' „	2,870	...	...	2,296	334	719	...	...	42	273	2,038	...	
9	158·38	1 „ 3' „	2,670	...	...	2,136	310	683	...	...	42	240	1,886	...	
10	159·17	1 „ 3' „	2,270	...	...	1,816	262	611	...	...	42	172	1,582	...	
11	160·01	1 „ 3' „	3,070	...	...	2,456	358	755	...	...	42	306	2,190	...	
14	162·77	2 „ 6' Arch.	6,601	...	...	1,969	2,802	2,543	796	797	116	...	2,319	56,000	
17	166·18	1 „ 3' „	3,870	...	...	3,096	451	899	...	...	42	438	2,798	...	
19	168·00	1 „ 3' „	3,670	...	...	2,936	430	863	...	...	42	405	2,646	...	
20	168·16	1 „ 3' „	3,270	...	...	2,616	382	791	...	...	42	339	2,342	...	
22	170·17	1 „ 3 „	2,670	...	..	2,136	310	683	...	...	42	240	1,886	...	
23	170·67	2 „ 3' „	4,070	...	...	3,970	580	1,114	...	...	52	718	2,746	...	
24	171·09	2 „ 3' „	3,034	...	...	2,856	292	682	...	...	52	246	1,430	...	
25	172·37	1 „ 3' „	2,898	...	...	1,656	238	575	...	...	42	141	1,430	...	
26	174·37	2 „ 3' „	2,870	...	...	2,296	328	735	...	...	52	305	1,582	...	
27	175·25	2 „ 3' „	3,170	...	...	2,536	364	789	...	...	52	364	1,734	...	
28	175·43	2 „ 3' „	4,370	...	...	3,496	508	1,005	...	...	52	600	2,342	...	
29	176·07	1 „ 3' „	2,270	...	...	1,816	262	611	...	...	42	174	1,582	...	
31	179·05	2 „ 3' „	2,570	...	...	2,056	292	682	...	..	52	246	1,430	...	
32	179·16	2 „ 3' „	2,870	..	...	2,296	328	735	...	...	52	305	1,582	...	
34	180·39	2 „ 3' „	3,470	...	...	2,776	400	843	...	...	52	423	1,926	7,500	
35	181·38	2 „ 3' „	3,470	...	...	2,776	407	843	...	...	52	423	1,926	...	
38	183·08	1 „ 3' „	2,270	...	...	1,816	262	611	...	...	42	174	1,582	...	
39	183·46	2 „ 3' „	3,470	..	...	2,776	400	843	...	...	52	423	1,926	7,500	
40	184·08	1 „ 3' „	2,070	...	...	1,656	238	575	...	...	42	141	1,430	...	
41	184·51	2 „ 3' „	3,598	...	...	2,056	292	682	...	...	52	246	1,430	...	
42	185·42	1 „ 3' „	2,070	...	...	1,656	238	575	...	...	42	141	1,430	...	
43	186·15	2 „ 3' „	3,084	...	...	2,056	292	682	...	...	52	246	1,430	...	
44	186·29	2 „ 3' „	3,770	...	...	3,016	436	897	...	...	52	482	2,038	...	
45	186·65	1 „ 3' „	2,270	...	...	1,816	262	611	...	...	42	174	1,582	...	
		Total Quantities,	1,04,289	...	...	77,521	13,712	25,764	796	797	1,610	9,869	61,067	183,000	
		Rate, Rs. ...	4 °/₀₀	....	...	15 °/₀	35 °/₀	35 °/₀	18 °/₀	75 °/₀	75 °/₀	75 °/₀	10 °/₀	4 °/₀	
		Amount, Rs. ...	417	...	...	13,954	4,799	9,017	144	598	1,208	7,402	611	732	
		Total, Rs. ...	...	...	...	...	...	...	...	...	...	...	...	...	38,882

Bara-Kotah Railway.

(Metre-Gauge.)

Kotah State (42·13 Miles).

V.—FENCING, &c.

1—Fencing.

Description of work.	Quantity.	Unit.	Rate.	Amount	Total.
			Rs.	Rs.	Rs.
Fencing Main Line	84·26	mile.	1,591	1,34,057	
Do. Extra for Station-yards ..	1·25	„	1,591	1,989	
Do. Extra for Level Crossings and Bridge-approaches	·50	„	1,591	796	
Boundary Pillars	42 13	„	25	1,053	
Total Fencing, Rs. ...	...	...	...	...	1,37 895
English Expenditure, Rs.	...	...	...	...	1,02,788
Indian „ „	...	...	...	...	35,107

Rate per Mile, Rs.3,273

For details of one mile of single fencing see Appendix B.

This Estimate provides for cost of fencing throughout.

Stone boundary pillars at Re.1 each, 25 to the mile, are provided to mark the land taken up permanently for the use of the Railway.

The type of fencing will be the same as used on the Goona-Bina Railway.

English charges are calculated on a basis of *1s. 2d.* per rupee.

2—Road Crossings.

Description of work.	Quantity.	Unit.	Rate.	Amount.	Total.
			Rs.	Rs.	Rs.
Level Crossing, Class A	2	each.	1,000	2,000	
Do. do. do. B	4	„	800	3,200	
Do. do. do. C	26	„	150	3,900	
					9,100

Rate per Mile, Rs 216.

Under Class A provision is made for gate-lodges, gate, guard-rails and earthwork, and metalling of approaches.

Class B is the same as Class A, with post and chains in place of gates.

Under Class C provision is only made for post and chains, guard-rails and earthwork in approaches.

Bara-Kotah Railway.

(*Metre-Gauge.*)

Kotah State (42·13 *Miles*).

V.—FENCING.

3.—Mile and Gradient Posts.

Description of Work.	Quantity.	Unit.	Rate.	Amount.	Total.
			Rs.	Rs.	Rs.
Mile-posts	42	each.	7	294	
Gradient-posts	56	,,	10	560	
Numbering Telegraph Posts	42·13	mile.	20	843	
					1,697

Rate per Mile, Rs.40.

Mile-posts will be of stone slabs.

Gradient-posts will consist of galvanised iron arms, with stencil lettering, fixed to old rail standards.

VI.—ELECTRIC TELEGRAPH.

Description of Work.	Quantity.	Unit.	Rate.	Amount.	Total.
			Rs.	Rs.	Rs.
Fittings for Telegraph Offices at Stations...	3	station.	500	1,500	
Do. do. do. ...	1	,,	1,000	1,000	
					2,500

Rate per Mile, Rs.59.

This Estimate allows for fittings of Telegraph Offices only, the cost of provision of Telegraph lines being borne by the Telegraph Department, Government of India.

Provision is made under General Charges XII—Engineering, Office Expenses—for cost of rent and maintenance during construction.

Bara-Kotah Railway.

(Metre-Gauge.)

Kotah State (12·13 Miles).

VII.—BALLAST AND PERMANENT-WAY.

1.—Ballast.

Description of work.	Quantity.	Unit.	Rate.	Amount.	Total.
			Rs.	Rs	Rs.
Ballast, Main Line	42·13	mile.	2,376	1,00,101	
Do. Station Sidings	5 5	,,	2.376	13,068	
Total Ballast, Rs ...	...	...	...	..	1,13,169
Add—Share of Engineering plant, Rs ...	...	...	...	...	3.500
Grand Total, Rs. ...	...	...	...	...	1,16,669

Rate per Mile, Rs.2,770.

The Section allowed for is 10 feet or 52,800 c.ft. per mile, estimated to cost on an average Rs 4½ per cent. c.ft.

2.—Permanent-way.

Dlscription.	Quantity.	Unit.	Rate.	Amount.	Total.
			Rs.	Rs.	Rs.
Permanent-way. Main Line	42·13	mile.	15,786	6,65,064	
Do. do. Station Sidings	5·5	,,	15,766	86,823	
Laying and Lifting Diversion	42·13	,,	100	4,213	
Maintenance of Track for one year ...	47·63	,,	300	14,289	
					7,70,389
Add—Share of Engineering plant ...	...	...	...	...	7,000
Total Permanent-way, Rs. ...	...	...	...	...	7,77,389
English Expenditure. Rs.	...	...	...	...	3,46,663
Indian ,, ,, ...	...	...	...	...	4,30,726

Rate per Mile, Rs.18,452.

For details of one mile Permanent-way see Appendix D. 1. The Permanent-way estimated for consists of 50lbs. steel rails, flat-footed 30 feet long, carried on sal sleepers $6' \times 8'' \times 4\frac{1}{2}''$. The fish-plate is the new I.S.R. standard pattern with 4 holes weighing 28lbs. per pair and the fish-bolts $3\frac{3}{8}''$ long and $\frac{3}{4}''$ diameter. A rate of Exchange of Re.1 = 1*s.* 2*d.* has been taken.

A through rate of Rs.100 per mile is allowed for Diversions as it is not known at present where these may be necessary to facilitate plate-laying. One-and-half miles of Permanent-way are provided for Kotah Station-yard and half a mile for each of the three wayside stations whilst $2\frac{1}{2}$ miles will be required for the Bara yard.

Bara-Kotah Railway.

(Metre-Gauge.)

Kotah State (42·13 Miles.)

VIII.—STATIONS AND BUILDINGS.

1.—Stations and Offices.

Stations.	Station Buildings.	Passenger-platforms.	Palisading and Gates.	Goods-platform.	Goods-shed.	Latrine.	Name-board.	Approach-road.	Amount	Total.
									Rs	Rs.
Tara	5,000	2,100	1,500	...	...	650	100	500	9,850	
Antha	5,000	2,100	1,500	3,000	3,500	650	100	500	16,350	
Kararia	5.000	2,100	1,500	..	...	650	100	500	9,850	
Kotah	15,000	6,000	1,500	6,000	3,500	650	100	2,000	34,750	
Total Stations & Offices, Rs.	...	...	...	...	...	...	...	...	...	70,800

Rate per Mile, Rs.1,680.

The Station accommodation consists of a Ticket-office 16′ × 16′, a Lamp and Store-room each 8′ × 7′ and a Waiting-shed for 3rd class passengers 27′ × 18′. Provision has been made for a 2nd class station at Kotah, but it is proposed at first to erect a temporary Station building only. The Passenger-platform will be 600 feet long and 50 feet wide with curbstones 12″ × 12″ boxed up by ballast to form a Platform-wall.

At Kotah a Platform-wall up to full height is estimated for.

Goods-sheds are allowed for at Antha and Kotah, but will not be built till necessity requires.

3.—Staff Quarters.

Description of Work.	Tara.		Antha.		Kararia.		Kotah.		Total.	Grand Total
	Number.	Amount.	Number.	Amount.	Number.	Amount.	Number.	Amount.		
		Rs.		Rs.		Rs.		Rs.	Rs.	Rs.
Station Master's and Signaller's Quarters	2	2 000	3	3,000	2	2,000	3	3,000	10,000	
Menials' and Police Quarters..	6	1,500	8	2,000	6	1,500	14	3,500	8,500	
Permanent-way Inspector's Quarters	..	..	..	..	..	..	1	3,500	3,500	
Running-room	..	..	..	..	..	..	1	3.500	3.500	
Drinking Wells, 6′ diameter	1	500	..	..	1	500	1	500	1,500	
	..	4,000	..	5,000	..	4,000	..	14,000	27 00 0	
Gangmen's Quarters ..	..	..	..	..	..	..	..	..	14,000	41.000

Rate per Mile, Rs.973.

The Station Master's quarters will consist of 2 main rooms 12′ × 10′ with verandah back and front and a courtyard.

The Signaller will have one main room with verandah and courtyard.

Gangmen's quarters of 4 units at every 3rd mile are estimated for.

The Permanent-way Inspector's quarters and Running-room will each consist of a three-roomed cottage with main rooms 16′ × 14′ and the usual small rooms, and a 9′ verandah.

Bara-Kotah Railway.

(*Metre-Gauge.*)

Kotah State (42·13 *Miles*).

VIII.—STATIONS AND BUILDINGS.

4.—Station Machinery.

Description.	Bara.		Tara.		Antha.		Kararia.		Kotah.		Total.
	Number.	Amount.	Number.	Amount.	Number.	Amount.	Number.	Amount.	Number.	Amount.	
		Rs.		Rs.		Rs.		Rs		Rs.	Rs.
Points and Crossings ..	9	3,850	3	1,100	3	1,100	3	1,100	9	3,850	
Home and Distant Signals ..	1	1,000	3	2,200	3	2,200	3	2,200	2	1,500	
Scotch-blocks	5	100	1	20	1	20	1	20	5	100	
Buffer-stops	5	250	1	50	1	50	1	50	5	250	
Weighing-machine ..	1	275	1	275	1	275	1	275	2	550	
Dating-press	..	..	1	50	1	50	1	50	1	50	
Well, 12 feet	..	..	..	..	1	2,500	..	..	1	2,500	
Water-tank	..	..	..	..	1	3,800	..	..	1	3,800	
Ashpits	4	4,000	..	..	2	2,000	..	..	2	2,000	
Piping, 8 inches	100'	300	..	..	1,000'	3,000	..	..	1,000'	3 000	
Water-columns	1	1,000	..	..	2	2,000	..	..	2	2,200	
Water-lift	..	..	..	..	1	500	..	..	1	500	
Engine-shed .. .	1	8,000	..	..	..	..	..	..	1	4,000	
Hydrants	1	500	..	..	..	..	..	..	..	..	
Turntable	1	6,500	..	..	..	..	..	..	1	6,500	
Weigh bridge	1	4,500	..	..	..	..	..	..	..	..	
	..	30.275	..	3,695	..	17,495	..	3,695	..	30,600	85,760
English Expenditure, Rs. ..	..	..	..	..	..	..	..	..	..	..	26,829
Indian ,, ,, ..	..	..	..	..	..	..	..	..	..	..	58,931

Rate per Mile, Rs.2,036.

For each 3rd class station two 1 in 12 and 1 in 8½ crossings are allowed for. The Signals will be wrought-iron lattice, the Home Signal being 30 feet and the Distant Signal 20 feet above ground level.

The Tank-house will be of rubble masonry with an upper and lower room forc acommodation of pumping staff.

The Tank will be of wrought-iron 24′×16′×4′.

The Ashpits will be 50 feet long.

Two Water-columns are estimated for at roadside watering stations.

The C. I. piping will be arranged for locally in India. The usual old rail charsa-frame will be used.

A Turntable and a temporary Engine-shed are allowed for at Kotah.

Provision is made for a separate yard at Bara with an Engine-shed, Turntable, and Weigh-bridge.

The English charges are calculated on a basis of Exchange of 1*s.* 2*d.* per rupee.

Bara-Kotah Railway.

(Metre-Gauge.)

Kotah State (42·13 Miles).

IX.—PLANT.

1.—Engineering.

Description of work.	Quantity.	Unit.	Rate.	Amount.	Total.
			Rs.	Rs.	Rs.
Trollies and Maintenance tools	47·63	mile.	50	2,381	
					2,381

Rate per Mile, Rs.57.

Under this head provision only has been made for tools and plant for maintenance purposes, required by the Engineering Department of the Open Line.

4.—Station and Office Furniture.

Description of work.	Quantity	Unit.	Rate.	Amount.	Total.
			Rs.	Rs.	Rs.
2nd Class Station	1	station.	2,500	2 500	
3rd „ „	3	„	1,000	3,000	
Running-room	1	„	500	500	
Total Station and Office Furniture, Rs. ...	...	..	...	...	6,000

Rate per Mile, Rs.142. .

Bara-Kotah Railway.

(Metre-Gauge.)

Kotah State (42·13 Miles).

XI.—ROLLING-STOCK.

1.—Locomotive.

Description of work.	Quantity.	Unit.	Rate.	Amount.	Total
	No.		Rs.	Rs.	Rs.
Locomotives	8	each.	27,654	2,21,232	2,21,232
English Expenditure, Rs.	...	...	...	...	1,97,212
Indian " "	...	...	...	...	24,020

Rate per Mile, Rs.5,251.

2.—Carriage and Wagons.

Description of work.	Quantity	Unit.	Rate.	Amount.	Total.
	No.		Rs.	Rs.	Rs.
First Class Carriage	2	each.	7,930	15,860	
Composite "	4	"	7,000	28,000	
Second Class "	2	"	6,100	12,200	
Third Class "	25	"	4,000	1,00,000	
Horse Boxes	3	"	4,230	12,690	
Covered Goods Vehicles	50	"	1,900	95,000	
High-sided Trucks	10	"	1,830	18,300	
Low-sided "	20	"	1,830	36,600	
Brake Vans	10	"	4,320	43,200	3,61,850
English Expenditure, Rs.	...	...	...	...	2,70,498
Indian " "	...	...	...	...	91,352

Rate per Mile, Rs.8,589.

The prices are taken from the Enclosure to Director-General of Railway's Circular No. 11, dated 21st September, 1896.

The rate of Exchange is taken at 1*s.* 2*d.* per rupee.

The stock estimated for is sufficient to allow of two mixed trains being made up as also a couple of goods trains and sufficient more stock for special traffic and for ballasting purposes.

Bara-Kotah Railway.

(*Metre-Gauge.*)

Kotah State (42·13 *Miles*).

XII.—GENERAL CHARGES.

Abstract.

Class.	Salary and Allowances. A.	Temporary Quarters. B.	Office Accommodation C.	Instruments. D.	Office Expenses. E.	Total.	Rate per Mile.
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
1. Direction	32,566	...	...	126	4,200	36,892	876
2. Engineering	1,30,968	18,450	2,500	2,178	8,400	1,62,496	3,857
3. Stores	6,572	200	1,500	...	420	8,692	206
4. Audit and Accounts ...	10,701	...	...	...	840	11,541	274
5. Medical and Sanitation ...	9,750	2,450	...	500	1,680	14,380	341
Total Rs. ...	1 90,557	21,100	4,000	2,804	15,540	2,34,001	5,554

Rate per Mile, Rs.5,554.

LIST OF ARTICLES REQUIRED FROM ENGLAND.

Description.	Quantity.	English cost. F. O. B.	English cost. 5th Freight.	English cost. Total.	Rate of Exchange.	English Cost.	Indian Charges.	Total.
		£	£	£	1s. 2d. = 17·1429 rupees per £ Sterling.	Rs.	Rs.	Rs.
Girders for Major Bridges ...	1,641·7 tons	15,524	1,592	17,116		2,93,417	17,541	3,10,958
Fencing ...	86 miles.	5,281	715	5,996		1,02,788	7,970	1,10,758
Permanent-way	47·63 „	18,304	1,918	20,222		3,46,663	26,856	3,73,519
Station Machinery ...	...	1,502	63	1,565		26,829	1,295	28,124
Rolling-stock ..	...	26,125	1,158	27,283		4,67,710	18,447	4,86,157
Total Rs....	...	66,736	5,446	72,182		12,37,407	72,109	13,09,516

BARA-KOTAH RAILWAY.

(Standard and Metre Gauges.)

DETAILS OF GENERAL CHARGES, APPENDICES AND LISTS.

Bara-Kotah Railway.

(*Standard and Metre Gauges.*)

Kotah State (42·13 *Miles*).

XII.—GENERAL CHARGES.

GENERAL ABSTRACT.

Class.	Salary and Allowances.	Temporary Quarters.	Office Accommodation.	Instruments.	Office Expenses.	Total.	Rate per Mile.
	A.	B.	C.	D.	E.		
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
1. Direction	32,566	...	...	126	4,200	36,892	876
2. Engineering ...	1,30,968	18,450	2,500	2,178	8,400	1,62,496	3,857
3. Stores	6,572	200	1,500	...	420	8,692	206
4. Audit and Accounts ...	10,701	...	...	...	840	11,541	274
5. Medical and Sanitation ...	9,750	2,450	...	500	1,680	14,380	341
Total, Rs. ...	1,90,557	21,100	4,000	2,804	15,540	2,34 001	5,554

Rate per Mile, Rs.5,554.

Bara-Kotah Railway.

(Standard and Metre Gauges.)

XII.—GENERAL CHARGES.

1.—DIRECTION.

A.—Salaries and Allowances.

Description of Work.	Quantity.	Unit.	Rate.	Cost.
			Rs.	Rs.
Salaries and Allowances	42·13 miles	miles	773	32,566
Total Direction and General, Rs. ...	...	...	...	32,566

Rate per Mile, Rs.773.

It is assumed that this extension will be constructed at the same time as the Main Line or the Goona-Bara Railway, and that one Engineer-in-Chief will administer both lines, a rateable charge is therefore made under this head based on the actual cost of the Goona-Bara Railway Head-Quarters Staff.

D.—Instruments.

Description of Work.	Quantity.	Unit.	Rate.	Cost.
			Rs.	Rs.
Instruments	42·13 miles.	mile.	3	126
Total Instruments, Rs. ...	...	...	...	126

Rate per Mile, Rs.3.

E.—Office Expenses.

Description.	Quantity.	Unit.	Rate.	Amount.	Total.
			Rs.	Rs.	Rs.
Office Expenses	42	miles.	100	4,200	4,200

Bara-Kotah Railway.

(*Standard and Metre Gauges.*)

XII —GENERAL CHARGES.

2.—ENGINEERING.

A.—Salaries and Allowances.

Class of Officers.	Number required.	Rate of pay, &c.	Travelling Allowances.	Cost per month.	Time employed.	Amount.	Total.
		Rs.	Rs.	Rs.	Years.	Rs.	Rs.
District Engineer	1	1,400	200	1,600	2½	48,000	
Assistant do.	1	600	150	750	2	18,000	
Do. do.	1	500	150	650	2	15,600	
Upper Subordinates	1	250	...	250	2	6,000	
Do. do.	1	100	...	100	2	2,400	
Do. do.	1	80	...	80	2	1,920	
Lower do.	4	50	...	200	2	4,800	
Permanent-way Inspector	1	200	...	200	1½	3,600	
Sub-Permanent-way Inspector ...	1	60	...	60	1½	1,080	
Head Clerk, District Office	1	60	...	60	2½	1,800	
Accounts Clerk	1	50	...	50	2½	1,500	
Clerks for District Office and Sub-Divisions	4	40	...	160	2½	4,800	
Cashiers for Sub-Divisions	1	60	...	60	2½	1,800	
Draftsman	1	75	...	75	2	1,800	
Tracer	1	40	...	40	2	960	
Daftry	1	10	...	10	2	300	
Office or Orderly Peons	3	8	...	24	2½	720	
Head Khallasies...	3	7	...	21	2	504	
Khallasies	20	6	...	120	2	2,880	
Chowkidars	2	6	...	12	2	288	
Waterman	1	5	...	5	2	120	
Sweepers	3	5	...	15	2	360	
Trollymen	40	6	...	240	1½	4,320	
Dâk Runners	6	6	...	36	1½	648	
Head Constable	1	8	...	8	2	192	
Constables	4	6	...	24	2	576	
Travelling Allowances	...	...	250	250	2	6,000	
Total, Rs. ...	...	...	...	...	...	...	1,30,968

Rate per Mile, Rs.3,109.

The provision allowed for the District Engineer's salary is made up as follows :—

	Rs.
Pay of Executive Engineer, 2nd grade	850
Extra grade pay in Foreign Service	150
Exchange Compensation Allowance	150
Contribution to Government of India for Furlough and Pension ...	250
Total, Rs. ...	1,400

Bara-Kotah Railway.

(Standard and Metre Gauges.)

XII.—GENERAL CHARGES.

2.—ENGINEERING.

B.—Quarters.

Description.	Quantity.	Unit.	Rate.	Amount.	Total.
			Rs.	Rs.	Rs.
District Engineer's Bungalow with Out-houses	1	each.	5,000	5,000	
Assistant Engineer's Bungalow with Out-houses	2	,,	3,000	6,000	
Upper Subordinates' Quarters with Out-houses	2	,,	1,000	2,000	
Lower do do. do.	4	,,	250	1,000	
Clerks' Quarters, 4 Units	2	,,	400	800	
Do. do. 2 do.	2	,,	200	400	
Office Menials' Quarters, 10 Units ...	3	,,	250	750	
Officers' Rest-houses with Out-houses and including Furniture	2	,,	1,250	2,500	
Total, Rs. ...	...	...	...	...	18,450

Rate per Mile, Rs.438.

C.—Office Accommodation.

Description.	Quantity.	Unit.	Rate.	Amount.	Total
			Rs.	Rs.	Rs.
District Engineer's Office including Furniture	1	each	1,500	1,500	
Assistant do. do. do. ...	2	,,	500	1,000	
Total, Rs.	...	...	...	...	2,500

Rate per Mile, Rs.60.

Bara-Kotah Railway.

(Standard and Metre Gauges.)

XII.—GENERAL CHARGES.

2.—ENGINEERING.

D.—Instruments.

DESCRIPTION.	Quantity.	Unit.	Rate.	Amount.	TOTAL.
			Rs.	Rs.	Rs.
Surveying.					
Transit Theodolites	2	each.	600	1,200	
Dumpy Levels	5	„	300	1,500	
Levelling Staves	10	„	75	750	
Prismatic Compass	2	„	120	240	
100-feet Measuring Chains	5	„	12	60	
Tapes, Measuring, Metallic, 100' and 50' ...	25	„	5	125	
Do. do. Steel	3	„	20	60	
Umbrellas, Surveying	5	„	15	75	
					4,010
Drawing.					
Drawing Instruments (in Box) ...	2	each.	50	100	
Straight Edges	2	„	10	20	
Rolling Parallel Rulers	2	„	40	80	
Set Squares	1	set.	15	15	
Scales	2	„	25	50	
Railway Curves	1	„	15	15	
Drawing Boards	2	each.	20	40	
T. Squares	2	„	7	14	
Two-foot Rules	1	doz.	12	12	
					346
TOTAL, Rs. ...	...	...	...	...	4,356
Deduct—Sale value on completion of work ...	..	...	...	...	2,178
Net amount estimated for	...	...	...	...	2,178

Rate per Mile, Rs.52.

E.—Office Expenses.

DESCRIPTION.	Quantity.	Unit.	Rate.	Amount.	TOTAL.
			Rs.	Rs.	Rs.
Office Expenses	42	miles.	200	8,400	
					8,400

Provision is included under this head for rent of Telegraph wires and instruments during construction.

Bara-Kotah Railway.

(Standard and Metre Gauges.)

XII.—GENERAL CHARGES.

3—STORES.

A.—Salaries and Allowances.

Description of Work.	Quantity.	Unit.	Rate.	Cost.
			Rs.	Rs.
Salaries and Allowances	42·13 miles	mile.	156	6,572
Total Stores, Rs. ..	..	..	..	6,572

Rate per Mile, Rs.156.

A share of the cost of the Head-Quarters Stores Establishment is allowed for in addition to the cost of the Divisional Staff.

B.—Quarters.

Description.	Quantity.	Unit.	Rate.	Amount.	Total.
			Rs.	Rs.	Rs.
Store Clerks' Quarters	1	each.	100	100	
Menials' Quarters, 4 Units	1	,,	100	100	
					200

Rate per Mile, Rs.5.

C.—Office Accommodation.

Description.	Quantity.	Unit.	Rate.	Amount.	Total.
			Rs.	Rs.	Rs.
Store-shed and Office including furniture	1	each.	1,000	1,000	
Workshop	1	,,	500	500	
					1,500

Rate per Mile, Rs.36.

E.—Office Expenses.

Description.	Quantity.	Unit.	Rate.	Amount.	Total.
			Rs.	Rs.	Rs.
Office Expenses	42	mile.	10	420	
					420

Bara-Kotah Railway.

(Standard and Metre Gauges).

XII.—GENERAL CHARGES.

4.—AUDIT AND ACCOUNTS.

A.—Salaries and Allowances.

Description of work.	Quantity.	Unit.	Rate.	Cost.
			Rs.	Rs.
Salaries and Allowances	42·13 miles	mile.	254	10,701
Total Audit and Accounts, Rs. ...	...	...	...	10,701

Rate per Mile, Rs.254.

This Estimate covers, in addition to the Head-Quarters Accounts Staff, the cost of the establishment necessary for the post audit of expenditure usual on State Railways.

E.—Office Expenses.

Description.	Quantity.	Unit.	Rate.	Amount.	Total.
			Rs.	Rs.	Rs.
Office Expenses	42	mile.	20	840	840

Bara-Kotah Railway.

(Standard and Metre Gauges.)

XII.—GENERAL CHARGES.

5.—MEDICAL AND SANITATION.

A.—Salaries and Allowances.

Class of Officers	Number required.	Rate of pay, &c.	Travelling Allowances.	Cost per month.	Time employed.	Amount.	Total.
		Rs.	Rs.	Rs.		Rs.	Rs.
Civil Surgeon's Allowance	1	100	..	100	2½ years.	3,000	
Hospital Assistants	2	50	..	100	„	3,000	
Compounders	2	15	..	30	„	900	
Dresser	1	10	..	10	„	300	
Attendants	2	7	..	14	„	420	
Hindoo Cook	1	6	..	6	„	180	
Waterman	1	5	..	5	„	150	
Sweepers	2	5	..	10	„	300	
Travelling Allowances	..	..	50	50	„	1,500	
				...			9,750

Rate per Mile, Rs.232.

It is proposed, subject to the sanction of the Government of India, that the Residency Surgeon at Kotah acts as Administrative Officer in charge of the Medical and Sanitary Staff on this Railway.

B.—Quarters.

Description.	Quantity.	Unit.	Rate.	Amount.	Total.
			Rs.	Rs.	Rs.
Hospital Assistants' Quarters	2	each.	250	500	
Compounders', &c., ...	2	„	50	100	
Menials' Quarters, 4 Units	1	„	100	100	
Do. do. 2 Units	1	„	50	50	
Hospitals (including furniture)	2	„	850	1,700	
					2,450

Rate per Mile, Rs.58.

D.—Instruments.

Description.	Quantity.	Unit.	Rate.	Amount.	Total.
			Rs.	Rs.	Rs.
Surgical Instruments	2	set.	500	1,000	
					1 000
Deduct—Sale value on completion of works	..	..	..	..	500
Net amount estimated for	..	..	..	..	500

Rate per Mile, Rs.12.

E.—Office Expenses.

Description.	Quantity.	Unit.	Rate.	Amount.	Total.
			Rs.	Rs.	Rs.
Office Expenses	42	mile.	40	1,680	
					1,680

REVISED ESTIMATE.

Goona-Bara and Kotah Railway Survey.

(*Standard and Metre Gauges*).

Length of Line (113 *Miles*).

APPENDIX A.

Sub-heads.	Quantity.	Unit.	Rate.	Per	Amount.	Total.	Cost per Mile.
			Rs.		Rs.	Rs.	Rs.
1. Survey	113	mile.	40·77	mile.	4,607		41
2. Plant	113	„	24·72	„	2,794		25
3. Establishment	113	„	283·12	„	31,993		283
TOTAL COST OF 113 MILES PER MILE, ...	...	...	...	...	...	39,394	349
English Expenditure, Rs.	...	...	...	...	...	...	
Indian „ ... „	...	...	...	...	...	39,394	
Distribution of Charges debitable to each State.							
Gwalior State, 21 Miles; Tonk State, 25 Miles	46	„	...	...	16,054	...	
Kotah State, 67 Miles	67	„	...	...	23,340	...	
						39,394	

Report and Specification.

This revised Estimate is passed for above work in accordance with letter No. $\frac{9}{C}$s, dated Camp Kotah, 15th January, 1896, from the Secretary to the Agent, Governor-General, Rajpootana and Central India, to the Secretary to the Government of India, P. W. D., to the effect that the Kotah Durbar has asked that the Survey for the Railway now in progress from Goona to Bara may be extended at the cost to Kotah, and that in anticipation of the approval of the Government of India the Engineer-in-Chief has been authorised to take the survey in hand.

P. T. S. LARGE, M.I.C.E.,
Engineer-in-Chief,
Goona-Kotah Railway Survey.

Bara-Kotah Railway.

(Standard and Metre Gauges.)

Details of cost of one Mile of Single Fencing, ordinary 5-wire type, with W.-I. posts.

APPENDIX B.

ITEMS.	Weight in tons.	English cost F.O.B. per ton.	Total English cost including ¼th sea-freight.	English cost at 1s. 2d. per rupee.	Indian charges at Port.	Carriage to site of work.	Total.	GRAND TOTAL.
		£ s. d.	£ s. d.	Rs.	Rs.	Rs.	Rs.	Rs.
559 Bases, Cast-iron ...	4·99	3 8 6	21 0 8	...	...	...	...	...
81 Bolts, Eye-straining, without Nuts and Washers	0·12	18 5 0	2 3 9	...	...	...	...	...
465 Posts, Wrought-iron, intermediate ...	2·53	6 5 0	17 16 8	...	...	...	...	...
46 Do. do. stiffening ...	0·73	7 6 0	5 18 9	...	...	...	...	...
9 Do. Cast-iron, straining	1·02	3 18 6	4 17 1	...	...	...	...	...
569 Wedges, Wrought-iron	0·09	13 17 6	1 6 6	...	...	...	...	...
20 Coils, Wire, strained in coils, 450 yards ...	1·46	10 11 6	16 10 11	...	...	...	...	...
	10·94	...	69 14 4	1,196	95	175	1,466	...
Erection	...	...	...	...	...	...	125	...
TOTAL COST OF ONE MILE SINGLE FENCING, RS. ...	...	...	...	...	...	...	...	1,591

Weight and prices are taken from the enclosure to Director-General of Railways' Circular No. 11, dated 21st September, 1896 (Appendix B).

The total English cost includes cost F.O.B. in England and ¼th sea-freight. The rate of Exchange is taken at 1s. 2d. per rupee. Indian charges at Port include ¼th sea-freight, insurance and supervision at 3 per cent. on English cost, and on whole freight and charges for landing and loading into wagons at Rs.2 per ton.

Carriage to site of work includes unloading and stacking at depôt and reloading in construction train Rs.16 per ton.

Bara-Kotah Railway.

(Standard and Metre Gauges.)

Details of Cost of Road Crossing.

APPENDIX C.

Description of work	Quantity	Unit	Rate.	Amount.	Total.
Level Crossings, Class A.			Rs.	Rs.	Rs.
Gate Lodge	1	each.	600	600	
Gates	1	pair.	225	225	
Guard-rails	1	,,	65	65	
Distant Blocks	10	each.	1	10	
Earthwork and Metalling	...	...	100	100	
Total Class A ...	...	...	...	...	1,000
Level Crossings, Class B.					
Gate Lodges	1	each.	600	600	
Post and Chains	1	pair.	40	40	
Guard-rails	1	,,	50	50	
Distant Blocks	10	each.	1	10	
Earthwork and Metalling	....	...	100	100	
Total Class B ...	...	...	...	...	800
Level Crossings, Class C.					
Post and Chains	1	pair.	40	40	
Guard-rails	1	,,	50	50	
Distant Blocks	10	each.	1	10	
Earthwork	...	...	50	50	
Total Class C ...	...	...	...	...	150

Bara-Kotah Railway.

(5' 6" *Gauge.*)

Detail of one Mile of Permanent-way 75lbs. Rails (new I. S. R. Standard) with Sal Sleepers.

APPENDIX. D.

ITEM.	Weight in tons.	English cost F.O B. per ton.	Total English cost including ½th Sea-freight	English cost at 1s. 2d per rupee.	Indian charges at Port.	Indian Cost.	Carriage to site of work.	TOTAL.
		£ s. d.	£ s. d	Rs.	Rs.	Rs	Rs.	Rs.
356 Rails, Steel, flat-foot 4" wide, soft way, with 2 holes at each end (new Standard)	117 86	4 8 6	521 10 8					
374 Pairs Fish-plates for above ..	5 34	5 18 6	31 12 9					
392 Sets Fish-bolts with Nuts and Washers	1·33	14 7 6	19 2 4					
370 Bearing-plates when used on sleepers next to joints only	2·50	8 0 0	21 6. 6					
3,494 Spikes when the sleepers next to joint are fully spiked, and the other with 6 spikes each	4·37	11 7 6	52 0 5					
	131·40	44 2 0	645 12 8	11,068	640	11 708	2,102	13,810
2,000 Sal Sleepers 9½'×10"×5" @ Rs.7 each	..	..	..	..	..	..	..	14,000
Laying track	..	..	..	..	..	..	..	600
TOTAL, Rs. ..								28,410

Weights and prices are taken from the Director-General of Railways' Circular No. 11, dated 21st September, 1896.

The total English cost includes cost F.O.B. in England and ½th sea-freight. The rate of Exchange is taken at 1s. 2d. per rupee. Indian charges at Port include ½th sea-freight, insurance and supervision at three per cent. on English cost and on whole freight and charges for landing and loading into wagons at Rs.2 per ton.

Carriage to site of work includes unloading and stacking at depôt, and reloading in construction train at Rs.16 per ton.

Bara-Kotah Railway.

(*Metre-Gauge.*)

Detail of one Mile of Permanent-way 50lbs. Rail with Sal Sleepers.

APPENDIX D. I.

Item.	Weight in tons.	English cost F.O.B. per ton.	Total English cost including $\frac{1}{8}$th Sea-freight.	English cost at 1s. 2d. per rupee.	Indian charges at Port.	Carriage to site of work.	Total.	Grand Total.
		£ s. d.	£ s. d.				Rs.	Rs.
356 Rails, Steel, flat-footed 50lbs new Standard ...	78·57	4 7 6	381 17 1					
374 Fish-plates per pair for above	4·67	6 10 6	32 11 3					
392 Fish-bolts with Nuts and Washers	0·65	15 2 6	10 2 11					
	83·89	26 0 6	424 11 3	7,278	566	1,342	9,186	
2,000 Sal Sleepers 6′ × 8″ × 4½″ at Rs.3	...	...	...	...	...	...	6,000	
Laying track	...	...	...	...	...	...	600	
								15,786

Weights and prices are taken from the Director-General of Railways' Circular No. 11, dated 21st September, 1896.

The total English cost includes cost F.O.B. in England and $\frac{1}{8}$th sea-freight. The rate of Exchange is taken at 1s 2d. per rupee. Indian charges at Port include $\frac{1}{8}$th sea-freight, insurance and supervision at 3 per cent. on English cost, and on whole freight and charges for landing and loading into wagons at Rs.2 per ton.

Carriage to site of work includes unloading and stacking at depôt and reloading in construction train at Rs.16 per ton.

Bara-Kotah Railway.

List of Dead Stock and Furniture, &c., required for 3rd Class Stations.

No I

DESCRIPTION OF ARTICLES.	Quantity required.	REMARKS
For one 3rd Class Station		
Badges, Gateman	1	
Do. Jamadar	1	
Do. Pointsman	2	
Do. Signalman	1	
Bags, Leather Audit	4	
Do do. Cash	4	
Bell, Rail	1	
Benches, Platform	1	
Boards Loading	1	
Do. Telegraph Chart	1	
Do. Extra Train	1	
Do. Notice	6	
Do. Local Number	1	
Buckets, Galvanized-iron	3	
Case, Ticket, Double	1	
Chains, Safety	4	
Do. Gate	2	
Clock, American, Office	1	
Date Indicator	1	
Dole, Iron	1	
Feeder, Water	1	
Do Oil	1	
Keys, Carriage	2	
Lamp, Hand Signal	4	
Do. Platform	4	
Locks, Pad Chubbs'	1	
Lota, Brass	1	
Machine, Weighing	2	
Nipper, Ticket	1	
Press, Dating	1	
Safe, Cash, Iron, Large	1	
Scissors, Lamp	1	
Seal, Cancelled	1	
Do. Code Initial of Station	1	
Do Name of Station	1	
Stools, Office	1	
Table, Lamp, Trimming	1	
Do. Office	1	
Tank, Oil, Small, 10 gallons' capacity	1	
Tarpaulins	2	

Bara-Kotah Railway.

List of Dead Stock and Furniture, &c., required for Kotah 2nd Class Station.

No. II.

Description of Articles.	Quantity required.	Remarks.
Badges, Brass for Gateman	1	
Do. do. Jamadar	1	
Do. do. Pointsman	4	
Do. do. Signalman	1	
Bags, Leather, Audit	4	
Do. Cash	8	
Basin, Enamelled-iron...	1	
Bell, Rail	1	
Benches, Platform	4	
Board, Loading	2	
Do. Telegraph Chart	1	
Do. Notice	6	
Do. Local Number...	1	
Box, Record, Large	1	
Do. Type	1	
Buckets, Galvanized-iron	4	
Do. Fire	12	
Counter of Sizes	5	
Couches, Reclining	2	
Case, Tickets, Double	1	
Chains, Safety, 7 feet long	12	
Chairs, Office	3	
Do. with arms	6	
Clock, American, Office	1	
Commode, complete	2	
Dole, Iron	1	
Date Indicator	1	
Feeder, Water	1	
Do. Oil	2	
Glass, Looking	1	
Jug, Enamelled-iron	1	
Keys, Carriage	2	
Lamp, Hand Signal	6	
Do. Table	2	
Do. Platform	6	
Locks, Pad, Chubbs'	1	
Lota, Brass	2	
Machine, Weighing	3	
Nipper, Ticket	2	
Press, Dating	1	
Safe, Cash, Iron, Large	2	
Scissors, Lamp	1	
Seal, Cancelled	1	
Do. Code Initial, Station	1	
Do. Name of Station	1	
Stand, Tripod for three Chatties	1	
Stools, Office	4	
Stand for Sheets	1	
Table, Dressing	1	
Do. Lamp, Trimming	1	
Do. Office	2	
Tank, Oil, Small, to hold 10 gallons	2	
Tarpaulins	6	
Tub, Bath	1	
Tube, Ticket	1	

Bara-Kotah Railway.

(Standard and Metre Gauges)

Kotah State (42·13 Miles).

List of Plant required for construction purposes and their distribution to Works.

No. III.

Item No.	Name of Work.	Total value of plant required for construction purposes.	Deduct sale value on completion of Railway works.	Net value debitable to each work estimated for.	Total value of plant debitable to works.
		Rs.	Rs.	Rs.	Rs.
1	Earthwork	6,000	3,000	3,000	
2	Kali Sindh River Bridge (Large) ...	50,000	25,000	25,000	
3	Alnia River Bridge (Large)	5,000	2,500	2,500	
4	Minor Bridges and Culverts ...	5,000	2,500	2,500	
5	Ballast	7,000	3,500	3 500	
6	Permanent-way	14,000	7,000	7,000	
	Total, Rs. ...	87,000	43 500	43,500	43,500

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